Rimba Raya Biodiversity Reserve Project

Project Document

Voluntary Carbon Standard v2007.1 (Nov. 2008)

METHODOLOGY

"VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1-0"

Developed by **Winrock International**
1st Validation by **RainForest Alliance**
2nd Validation by **Bureau Veritas**

REDD

Reduced Emissions from Deforestation and Degradation through Avoided Planned Deforestation

May 15, 2011

Project Developer

InfiniteEARTH™
Beyond Carbon. Beyond Sustainability.

Acknowledgements

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and

Shell Canada Limited

for their tireless work in the initial development of the peat methodology *("Baseline and monitoring methodology for conservation projects that avoid planned land use conversion in peat swamp forests, Version 5.2, March 2010"*) and seeing it though the first validation.

Project Profile Highlights

Project Owner	**PT Rimba Raya Conservation**
Project Developer	Infinite-Earth Limited
NGO Partner & Project Beneficiary	Orangutan Foundation International
Host Country	**Indonesia**
Region	Kalimantan (Island of Borneo)
Province	Central Kalimantan
Regency	Seruyan
Forest Type	HCV Tropical Peat Swamp Forest
Total Project Management Zone	**91,215 ha**
Estimated Total Avoided Emissions in Project Management Zone	**>350 million t CO_2e**
Total Area at Risk of Deforestation	91,215 ha
Project Area (Carbon Accounting Area)	**47,237 ha**
Total Reduced Emissions in Project Area (Carbon Accounting Area)	**104,886,254 t CO_2e**
Project Start Date by Project Developer	November 2008
Crediting Period Start Date	**July 2009**
Primary Deforestation Driver	**Planned Deforestation**(Palm Oil supported by government policy)
REDD Standards	**VCS & CCBA**
Methodology	*"VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1-0"*
Endangered, Threatened & Vulnerable Mammals in Project Zone	**29** including the Endangered Bornean Orangutan
Endangered, Threatened & Vulnerable Species (All) in Project Zone	**94+**
Communities in Project Area and Project Zone	0 in Project Area. 14 in Project Zone

Project Document

Template: Project Description Template, 19 November 2007

Project: Rimba Raya Biodiversity Reserve Project

Date: May 15, 2011

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1. Description of Project

1.1. Project Title

The Rimba Raya Biodiversity Reserve Project

1.2. Type/Category of the project

Reducing Emissions from Deforestation and Degradation (REDD) through Avoided Planned Deforestation (APD). The project is a single, standalone project, not a grouped project.

1.3. Estimated amount of emission reductions over the crediting period including project size:

This project qualifies as a Mega Project. It will produce an average estimated 3,527,171 t CO_2e emissions reductions per year, totaling **104,886,254t CO_2e over a 30-year project life**.

1.4. A brief description of the project:

Between 1990 and 2005 Indonesia was losing just over 2% of its forest cover annually, a rate of nearly 1.9 million hectares a year[1] Today, that number has grown to more than 2,500,000 hectares annually – an area roughly the size of Belgium (FAO 2006).Extensive loss of national forest cover has been brought about through clearing of forest areas with fire to open up land for agricultural use, especially palm oil. From 2000-2005 Indonesia's forest loss represented the second highest annual loss of forest cover by area of any country in the world (after Brazil). In this same time period, Indonesia planted 1.6 million ha of oil palm, increasing production by 87% (FAO 2006).

As part of this conversion process, post-fire clearing and draining of peat lands has rapidly pushed the country to be amongst the world's largest emitters of greenhouse gases (GHGs). Today, Indonesia ranks just behind the U.S. and China as the third largest[2] emitter of greenhouse gas emissions, despite being a non-industrialized nation whose economy accounts for less than 1% of global GDP[3]. The destruction of Indonesia's forests, the 3rd largest expanse of tropical rainforest in the world, combined with massive peat-based GHG emissions is fuelling local and global environmental concerns. The task that lay ahead for Indonesia and those who are seeking new solutions to value its remaining forests is to create new economic opportunity from these environmental challenges by linking local and national forest resources with the global market for environmental services.

The Rimba Raya Biodiversity Reserve Project, an initiative by InfiniteEARTH, aims to reduce Indonesia's emissions by preserving 91,215 hectares of tropical peat swamp forest. This area, rich in biodiversity including the endangered Bornean orangutan, was slated by the Provincial government to be converted into four palm oil estates. Located on the southern coast of Borneo in the province of Central Kalimantan, the project is also designed to protect the integrity of the adjacent world-renowned Tanjung Puting National Park, by creating a physical buffer zone on the full extent of the ~90km eastern border of the park.

- **Total Project Management Area (Project Zone):** 91,215 hectares of High Conservation Value Tropical Peat Swamp Forest
- **Carbon Accounting Area (Project Area):** 47,237 hectares *of peat swamp forest*
- **Carbon Stocks conserved within the Carbon Accounting Area** (after non-permanence buffer): 104,886,254 tons *of CO_2e*

[1] FAO Global Forest Resources Assessment 2005
[2] Behind #1 China and #2 United States of America
[3] World Bank and IMF Global Rankings - 2008

- **Project Start Date:** November 2008
- **Crediting Period Start Date:** July 2009

In the absence of the Rimba Raya Project, the project area would be converted to palm oil plantations by logging, burning to clear unused felled trees and remaining forest, and systematic draining of the peatland area. This would result in the release of both above and belowground carbon deposits. As a result, millions of tons of GHG emissions would be released into the atmosphere over the lifetime of the plantations. Increasingly scarce forest habitat supporting orangutans and more than 50 other endangered species would disappear completely. The 14 local forest communities along the eastern edge of the reserve would also face the threat of their land being appropriated by palm oil companies.

InfiniteEARTH (IE), the principal project proponent, seeks to use the sale of carbon credits generated by the Voluntary Carbon Standard (VCS) through the Reducing Emissions from Deforestation and Degradation (REDD) Avoided Planned Deforestation (APD) mechanism to provide a sustainable revenue stream sufficient to curtail the clearing of Rimba Raya. The Rimba Raya Project will funnel substantial and sustainable financial resources for project area protection, local community development, and provincial government infrastructure and support in order to create a viable alternative to forest conversion in Indonesia.

The Rimba Raya Biodiversity Reserve Project recognizes that in order to launch and sustain a new mechanism for valuing forests on the ground, local community involvement is not just a sufficient feature of the project, it is a necessity. Local communities have been participating in and will continue to be integrally involved in the planning and development of various aspects of the project. Programs that Rimba Raya communities have expressed interest in helping to develop and implement, include: water filtration devices, distribution of clean stove technology, solar lighting, increased access to healthcare, early childhood development materials and tools including the one laptop per child program, training in project and reserve management, and environmental conservation education. The project will create local employment in protecting the Carbon Accounting Area, implementing an integrated fire management plan, and patrolling illegal logging and wildlife poaching.

InfiniteEARTH aims to demonstrate that protecting endangered peat swamp forest is commercially, socially, and environmentally advantageous. The InfiniteEARTH vision is to develop a project that harnesses the global carbon market in order to successfully compete with commercial agricultural interests in order to provide social and environmental benefits that would not otherwise be attainable. Rimba Raya peat-swamp forests and the threats it faces are not unique, rather representative of environmental degradation of increasingly scarce forest and peatland resources in Indonesia. With the Rimba Raya Project, InfiniteEARTH is determined to create an operational, voluntary market and community involvement model that can be replicated in peat swamp forest ecosystems across Indonesia for decades to come.

1.5. Project location including geographic and physical information allowing the unique identification and delineation of the specific extent of the project:

- Project start date: Date on which a financial commitment was made to the project and the project reached financial closure.

The Rimba Raya Carbon Accounting Area comprises 47,237 hectares of uninhabited lowland peat swamp forest located in Seruyan Hilir District, Danau Sembuluh and Hanau, Seruyan Regency, in the province of Central Kalimantan, Indonesia (Figure 1). The Carbon Accounting Area defines the boundary for CO_2 emissions reduction accounting and lies within a 91,215 hectare Project Management Zone that will be protected and managed by the Project (Figure 2).

The Carbon Accounting Area boundary is coincident with approved palm oil concession boundaries derived from Indonesian Government spatial (G.I.S.) data (Figure 3). Figure 4 shows the location of the project in the context of land use planning and oil palm estate development in Central Kalimantan, with the project area being slated for conversion to four oil palm concessions.

The Project Management Zone lies between 112°01'12 "- 112°28'12" east longitude and 02°31'48"-03°21'00" south latitude and is bounded by Tanjung Puting National Park in the west, the Java Sea in the south, the Seruyan River in the east, and a palm oil concession in the north. The geo-referenced boundary for the Project Zone was derived from Indonesian government G.I.S. data and GPS field survey data. The Carbon Accounting Area and Project Management Zone boundary features, attributes and metadata are stored in a G.I.S.

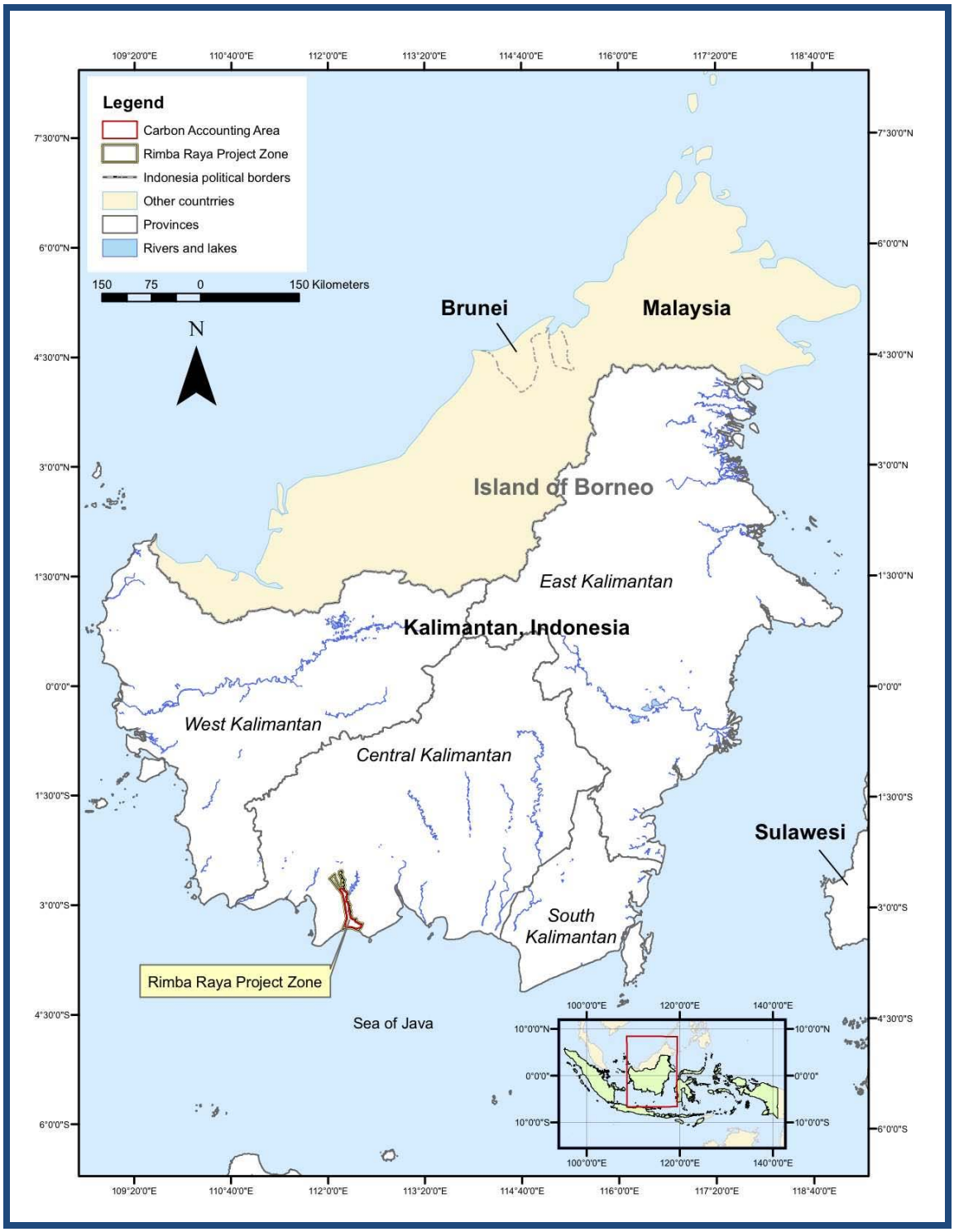


Figure 1. Regional Project Location

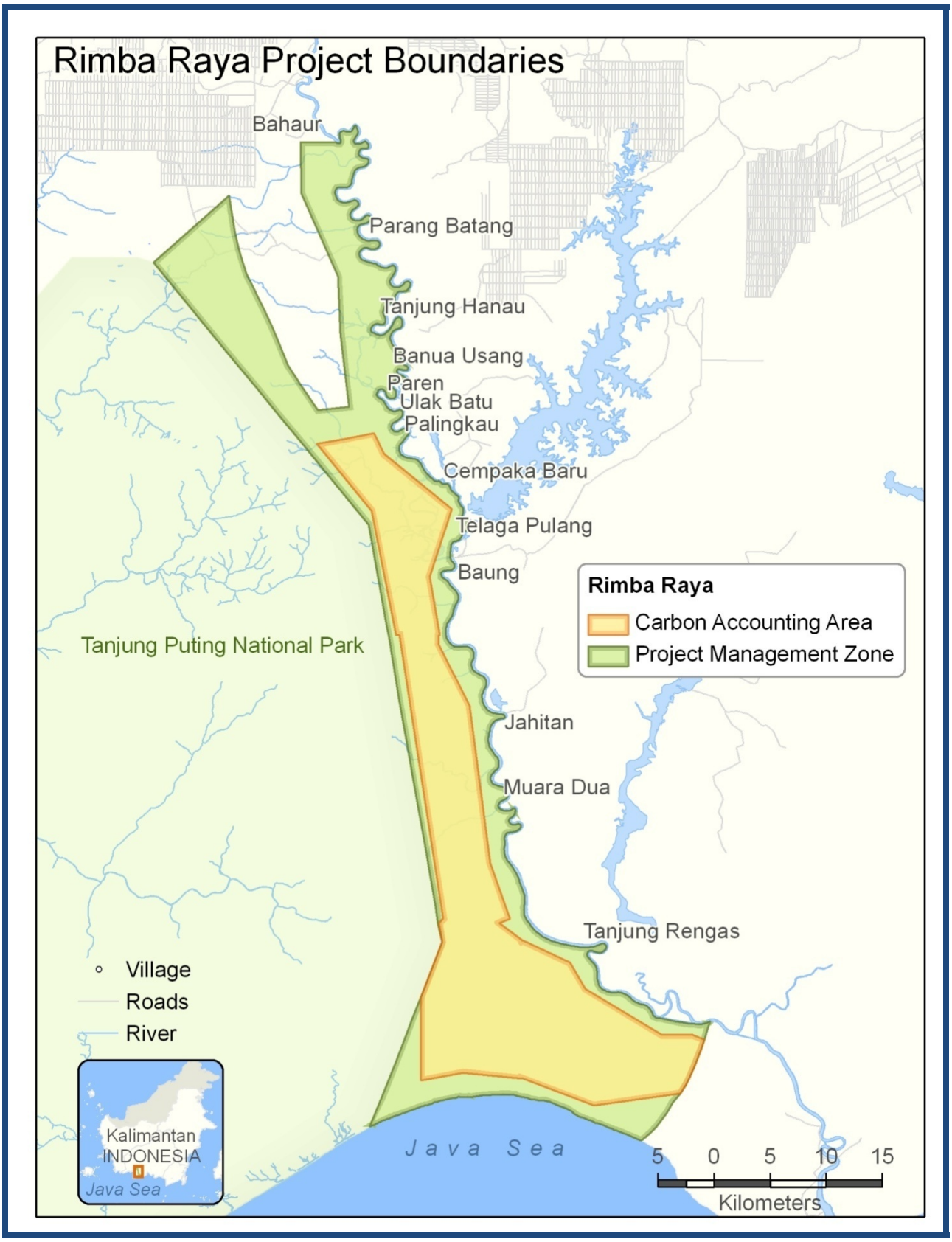


Figure 2. Rimba Raya Project Management Zone and Carbon Accounting Area. Tanjung Puting National Park shown abutting the project's western boundary.

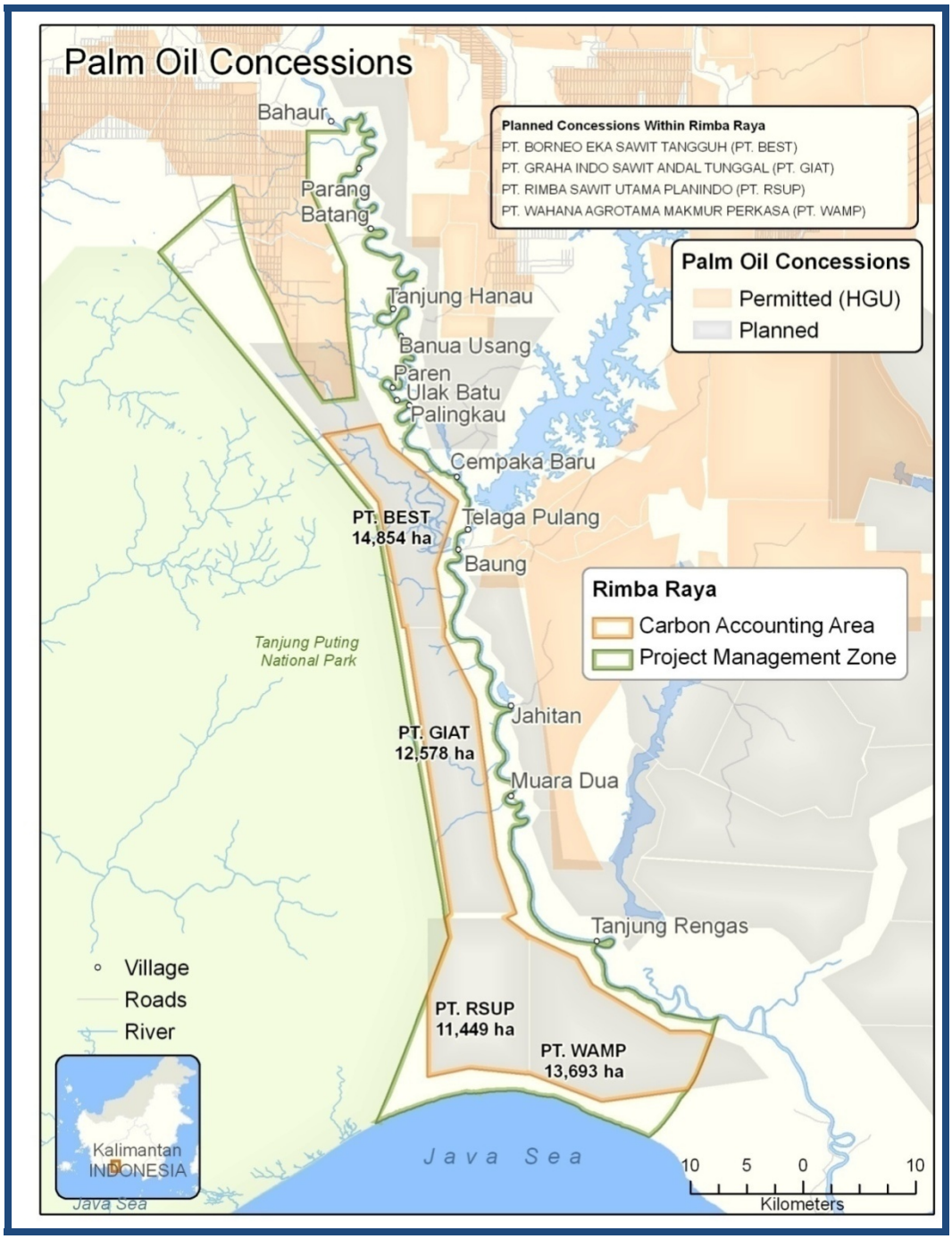


Figure 3. Permitted and Planned Oil Palm Concessions in and around the Project Management Zone. The Carbon Accounting Area is coincident with planned oil palm concessions but excludes the area of active concession and 3km buffer south of the active concession.

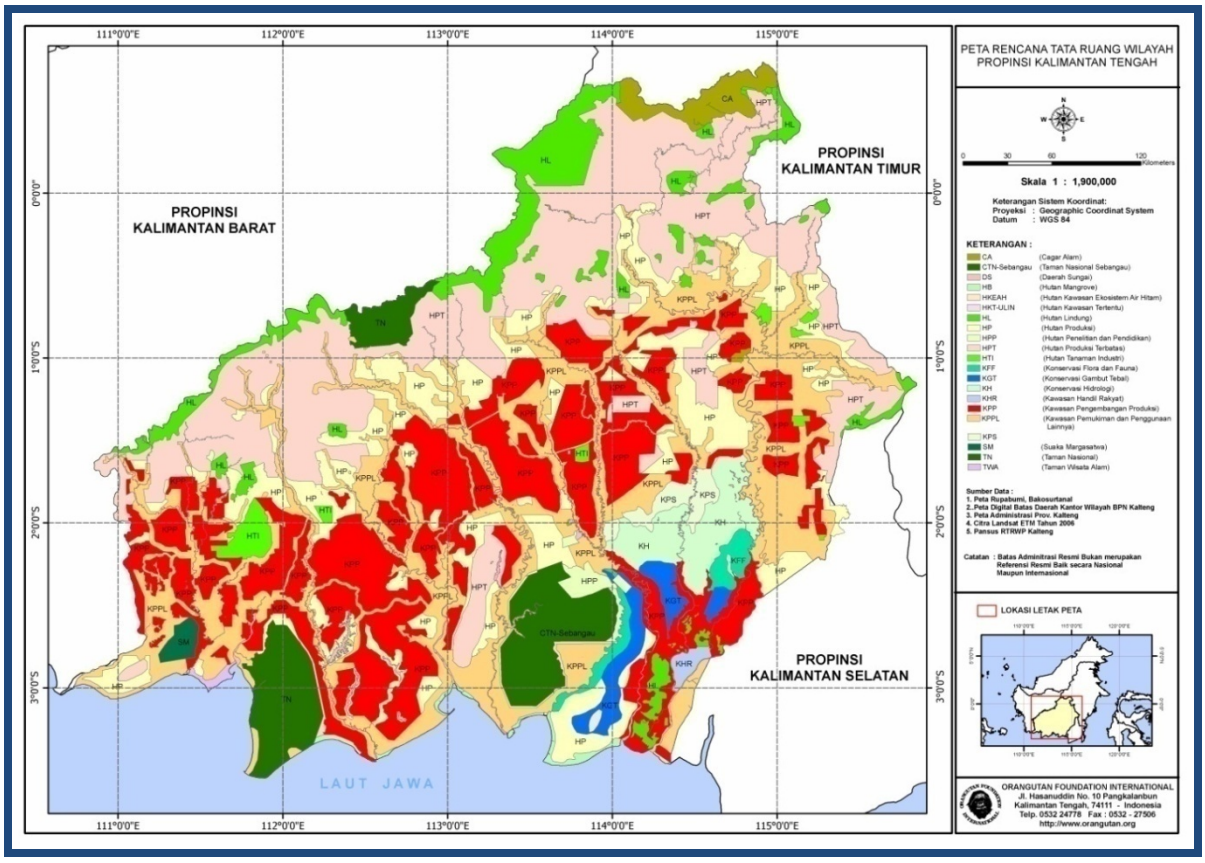


Figure 4. Central Kalimantan Provincial spatial land use plan (RTRWP) 2006 showing areas newly planned for conversion to industrial agriculture (KPP lands shown in red) including the Project Management Zone.

1.6. Duration of the project activity/crediting period:

- *Project start date: Date on which a financial commitment was made to the project and the project reached financial closure.*

Project start date: November 2008

This is the date on which the government issued a map delineating the concession license area boundaries in the name of PT Rimba Raya Conservation and confirming that there are no conflicting recognized claims to the Carbon Accounting Area. Although InfiniteEARTH had undertaken significant work and investments in the project area prior to November 2008, it was from this point that a specific date can be identified where project development was focused.

- *Crediting period start date: the date the first monitoring period commenced*

Crediting period start date: July, 2009

Project area monitoring started January 2009 with focused field patrols, stratification of the project area and a series of G.I.S. and remote sensing analyses of project conditions. This was followed by field survey design, SOP development and field team training in May 2009 prior to field surveys for carbon stock assessments beginning June 24, 2009. July 1, 2009 starts the crediting period.

- *VCS project crediting period:* A maximum of ten years that may be renewed at most two times.

A **30-year crediting period** will be used for this project.

Conditions prior to project initiation:

Climate

Rainfall in the Carbon Accounting Area is approximately 2500 – 2700 mm per year. Monthly rain accumulation varies year to year with dry season months typically lasting from June to October. The wet season, typically occurring between October and May experiences two peaks in rainfall, one in November and one in February. Based on the Schmidt and Ferguson classification, the project Zone is classified as a wet to very wet tropical rainforest region. Periods of extended dryness are known to occur during El Niño years, when the dry season may last from June to December or longer. There are no major climate disturbances in the Carbon Accounting Area.

Hydrology

The majority of the Carbon Accounting Area falls within the Seruyan watershed draining to the Seruyan River, which forms the eastern border of the Project Zone. The Seruyan watershed itself covers approximately 13,144 km^2 and is comprised of a complex network of rivers and associated swamps.

Other minor watersheds in or near the Project Zone lie in the southern portion of the Project near the coastline, with headwaters less than 10 km from the sea. Tributaries of the Seruyan River generally arise in the western portion of the Project Zone and in Tanjung Puting National Park, and flow east-south-east to the Seruyan which flows south to the Java Sea. The average width of the Seruyan River is 25-110 meters with a depth ranging from 7-23 meters. Smaller tributaries form an extensive dendritic network in project area swamps.

During the rainy season, annual overflow of the Seruyan River floods the villages located on either side of the river up to a distance of ± 2 km from the river. In the dry season, the Seruyan drops significantly, with numerous exposed sandbars and river water levels ca. 8-10 meters below river banks in many areas.

Geology, Topography and Soils

The underlying geology of the Carbon Accounting Area is dominated by depositional substrates of recent origin compared to the rest of Kalimantan. Co-dominant soil types derived from peat and riverine alluvium underlie most of the Carbon Accounting Area. Coarser-textured sediment-derived soils are also found to the north and east of the reserve. Within the project area there are ten dominant soil types comprising five soil associations (Table 1).

The Project Management Zone is situated in the low-lying swamp complex characteristic of coastal Borneo. Elevation ranges between 0 and 10 meters above sea level, and the entire study area is generally flat with 0-8% slopes on dry ground and 0-3% slopes in wetlands and peat swamps. Eight land systems are found within the project zone with the Mendawai Land System (MDW) being dominant. The MDW system is a regional system of shallow peat swamps with a slope < 2% with peat as the primary material.

Table 1. Soil Types[4]

Soil Types in the Carbon Accounting Zone				
Dominant Soils	**General Description**	**Parent Material**	**Sub-landform**	**Relief**
Haplohemist, Sulfihemists	Moderately decomposed peat soils some of which are sulphic	Organic	Peat Dome	Flat
Endoaquepts, Sulfaquents	Saturated Inceptisols and Saturated Sulphic Entisols	Alluvium	Delta or Estuary	Flat
Endoaquepts, Dystrudepts	Saturated Inceptisols and Acidic Inceptisols	Alluvium	Alluvial Flood Plane	Flat
Quartzipsam-ments, Durorthods	Quartzic Entisols and Spodosols with a Cemented Hardpan	Sediment	Terraces	Flat - Rolling
Haplorthods, Palehumults	Freedraining Spodosols and Humus rich Ultisols	Sediment	Terraces	Flat - Rolling

Wetlands International mapping of peat distribution in the project area shows shallow peats distributed throughout most of the Carbon Accounting Area (Figure 5). Carbon stock field surveys showed that peats were moderately deep and typically exceeded the limits of the 4 to 6 meter peat probe used to measure peat depth **(see Carbon Survey Reports Annex 1A and 1B).**

[4] A soil map for the Project Zone was produced using the Soil Resource Exploration Map (Pontianak MA49, Centre for Soil and Agroclimate Research, Bogor, Indonesia) at a scale of 1:1,000,000. Descriptions are derived from Soil Taxonomy (Soil Survey, USDA 1999).

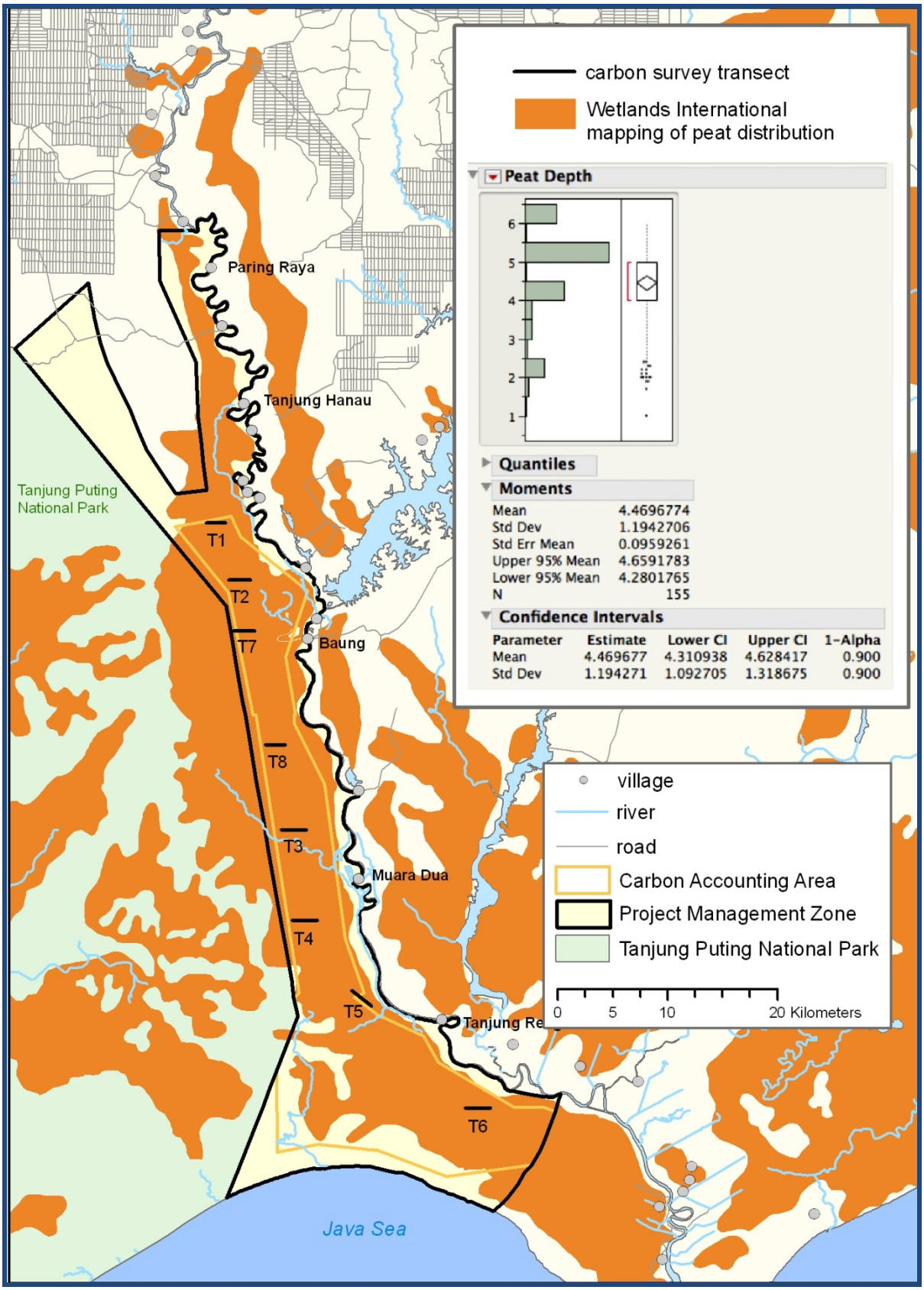


Figure 5. Peat map for Project Zone. GIS data from published peatlands map by Wetlands International. Ground-based peat depth measurements taken during the Carbon Assessment Survey, June 2009.

Biodiversity

Rimba Raya is an important part of the greater Tanjung Puting forest mosaic comprised of terrestrial and aquatic ecosystems that house hundreds of species of flora and fauna and provide habitat for many rare and endangered species. A recent study of the Project Management Zone documented high biodiversity including 361 species of birds, 122 species of mammals, and 180 species of trees and woody plants likely to be present in the project area.

Rimba Raya biodiversity notably includes the endangered Bornean orangutan (*Pongo pygmaeus*), the only great ape outside of Africa, whose populations have declined 95% in the last century. Tanjung Puting National Park houses one of the largest protected orangutan populations, and the Rimba Raya project area augments adjacent Tanjung Puting orangutan habitat by ca. 14%.

Project area forests likely house eight other primate species including the endangered proboscis monkey (*Nasalis larvatus*) and agile gibbon (*Hylobates agilis*). More than half of all mammals occurring in Borneo are likely present on the project area including the more common sun bear (Helarctos malayanaus), barking deer (Muntiacus muntjak), and bearded pig (Sus barbatus) and the endangered Borneo Bay cat (Catopuma badia) and hairy-nosed otter (Lutra sumatrana). An estimated 45 species of bats (47% of the Borneo list) are likely to be present in the project area. A third of these are IUCN Red Listed, 13 of which have restricted ranges or are endemic to Borneo.

Some 361 bird species are likely present in the project area. Of these, 156 species are of national and/or international conservation significance. Eighty species are listed by the IUCN as Threatened or Near-Threatened with Global Extinction, including the Endangered Storm's Stork (*Ciconia stormi*), which is considered one of the twenty most endangered bird species in the world.

Borneo is one of the richest islands on the Sunda Shelf for reptiles and amphibians (MacKinnon et al 1996) but remains understudied. Tanjung Puting National Park's herptofauna has never been surveyed, and the full suite of herptofauna likely present in the park and Rimba Raya project area remains unknown. Of particular concern is the endangered False Ghavial (*Tomistoma schlegelii*) which has been hunted to extinction in most of Borneo, but is still present in TPNP, and may still be present in the Seruyan River, as well as the protected Estuarine Crocodile (*Crocodylus porosus*) which is reported to be present in the project area but has suffered severe over-hunting.

Plant species diversity in the project area is no doubt extremely high, and many elements of the flora are rare, threatened or protected species. Comprehensive, systematic floristic surveys have not been conducted in either nearby Tanjung Puting National Park or the project area so the present list is incomplete. Of the 180 plant taxa expected to occur in the project area, 25 species are critically endangered and 14 endangered. Many of these are Dipterocarps that have been targeted by the timber industry and include *Shorea balangeran*, which occurs in deep swamps of the project area and is considered the most highly threatened dipterocarp on Borneo.

Vegetation and Land Cover

Rimba Raya is comprised of a diversity of natural and human-disturbed wetland and dry land vegetation types (Figure 6), dominated by peat swamp forests on peat soils ranging from 2 to more than 6 meters deep. Deforested peat swamps form extensive peat shrublands in the south and seasonally inundated wetlands along The Baung and Seruyan Rivers. Peatlands grade into kerangas forest and open kerangas scrub on sandy soils in the southwestern Carbon Accounting Area and the northwestern Project Management Zone. The northwestern part of the project adjacent to Tanjung Puting National Park also supports increasingly rare lowland forest on mineral soils, which contributes significantly to the biodiversity of the project area. Figure 7 shows a satellite image view of forested areas in Rimba Raya. Carbon Accounting Area vegetation is shown in Figure 8. Peat swamp forest and other peatland types comprise 78.5% of the Carbon Accounting Area (Table 2). All but the kerangas forest and kerangas open scrub types are on peat substrates. The land cover accuracy assessment demonstrated a 90.0% classification accuracy

for lightly degraded peat swamp forest and 81.3% overall within the project management zone. **See reports on Land Cover Analysis (Annex 2A) and Land Cover Accuracy Assessment (Annex 2B) for a complete description.**

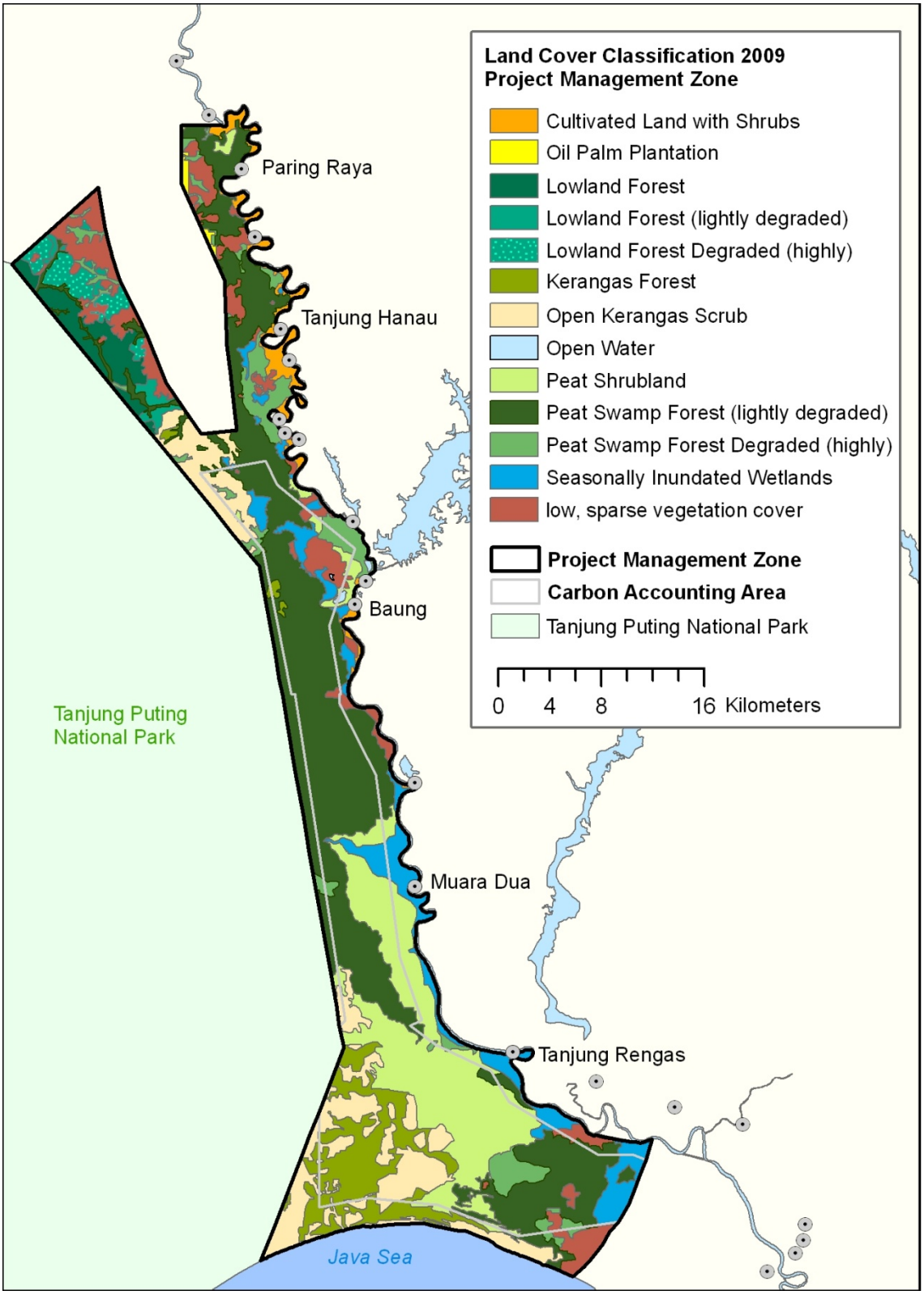


Figure 6. Rimba Raya Vegetation and Land Cover 2009

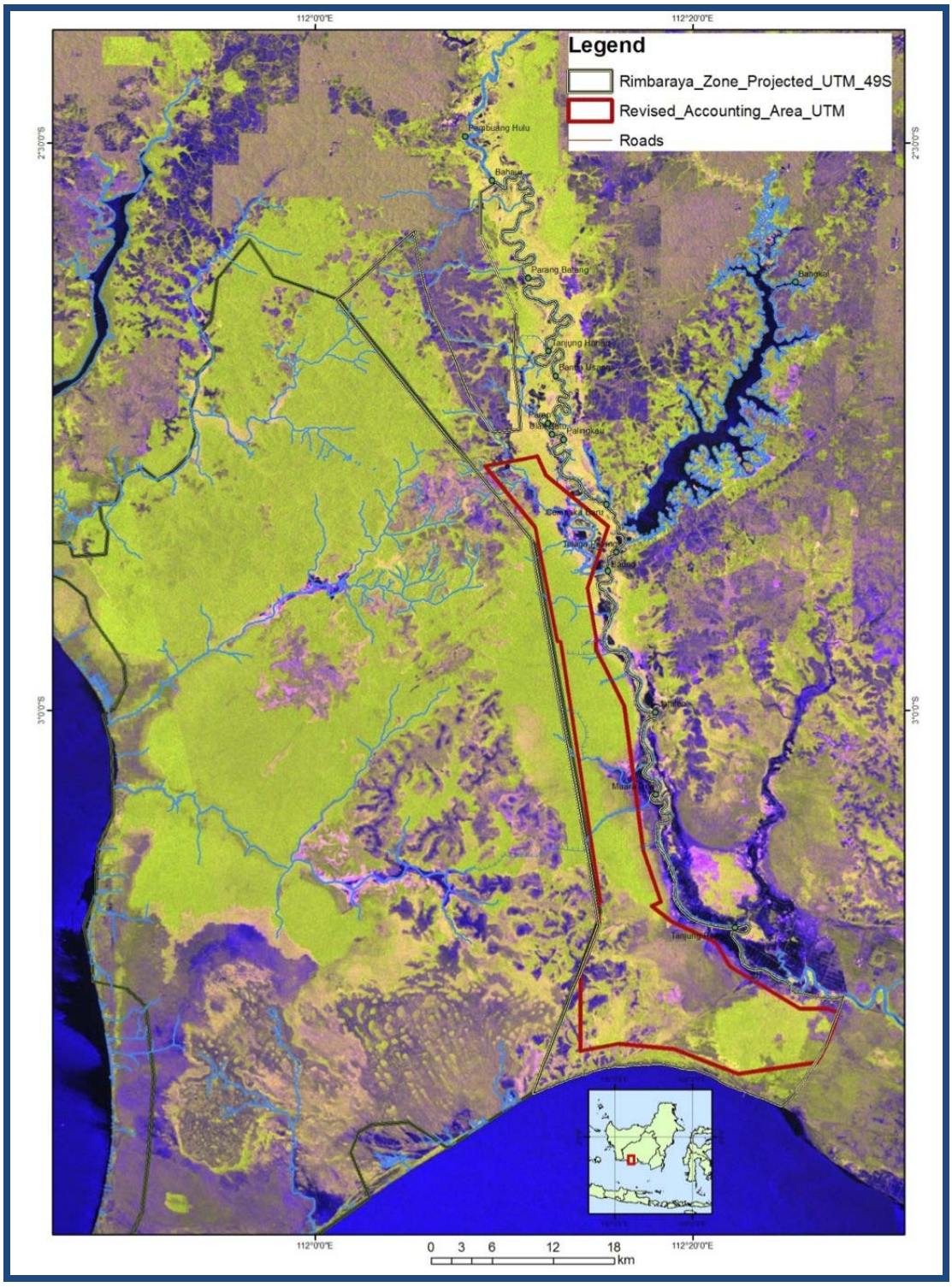


Figure 7. Forest and Vegetative cover of the project area shown on the Japanese Advanced Land Observing Satellite (ALOS). Green areas indicate forest cover; purple areas indicate bare or exposed soil.

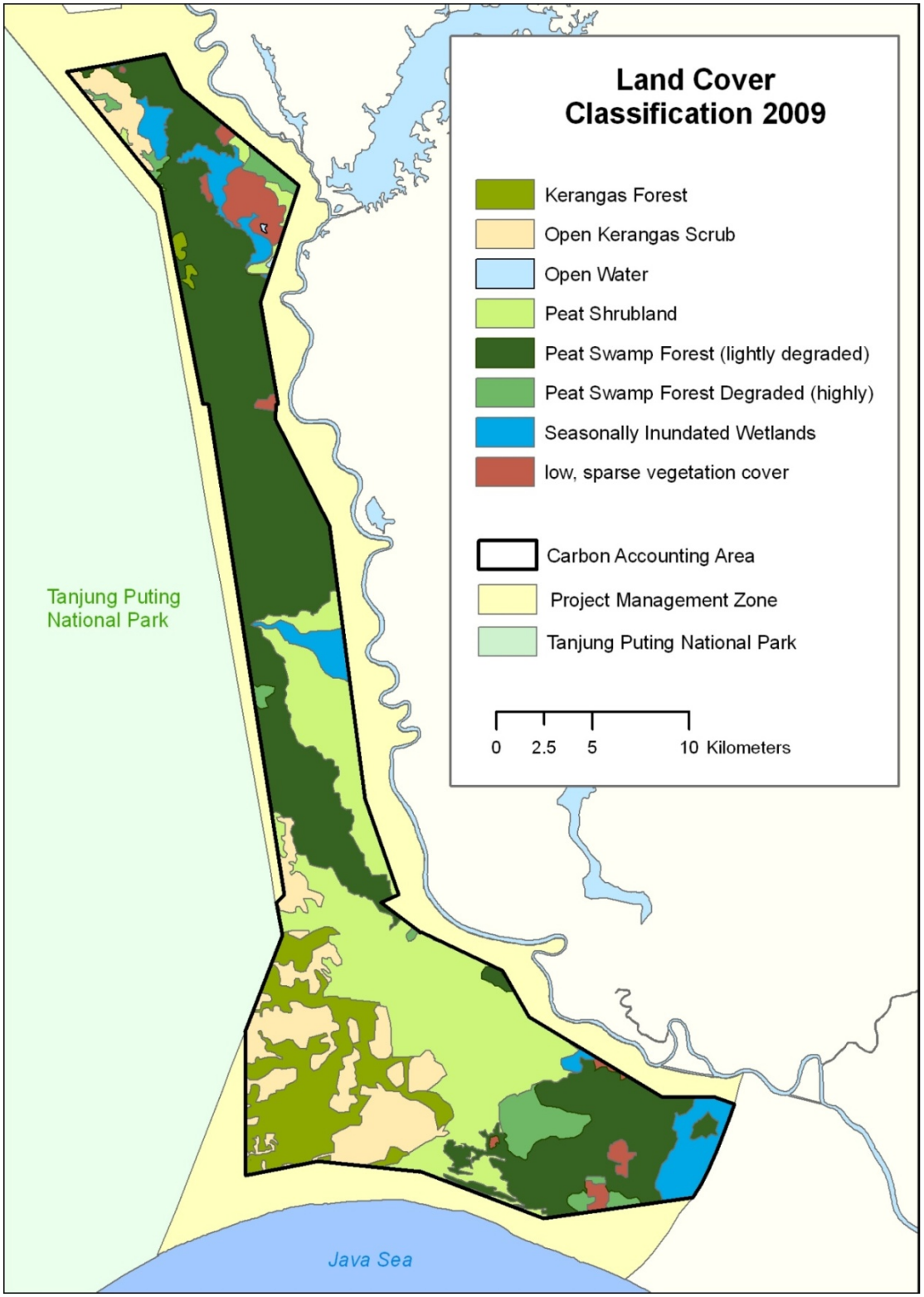


Figure 8. Land cover and Vegetation in the Carbon Accounting Area

Table2. Land Cover Classification – Carbon Accounting Area

Land Cover in the Carbon Accounting Area		
Land Cover Description	**Extent (Ha)**	**% Total**
Peat Swamp Forest (lightly degraded)	**19,215**	40.7
Peat Swamp Forest Degraded (highly)	**1,734**	3.7
Peat Shrubland (<20% Tree Cover)	**12,040**	25.5
Kerangas Forest	**4,810**	10.2
Kerangas Open Scrub	**5,349**	11.3
Low, sparse vegetation cover	**1,342**	2.8
Seasonally Inundated Wetlands	**2,704**	5.7
Open Water	**43**	0.1
Grand Total:	**47,237**	**100.0**

Land Use

Legally, land in the Project area is zoned for use as a commercial timber production forest zone and for conversion to agricultural production. This zoning combination results in the complete clearance of degraded natural forests after they have been conventionally logged. In the instance of the project zone and Carbon Accounting Area, this would also result in the draining of peat swamp areas sufficiently enough for the planting of commercially produced agricultural crops. Prior to project intervention, the Project Zone was slated for the conversion of natural forest to oil palm plantations.

The project area has been selectively logged, most intensively during the 1980s and 1990s when several sawmills operated on the Seruyan River. Because the area is predominated by low-lying and frequently inundated swampland, a series of logging canals and rails were constructed by the logging industry to gain access to selected hardwood trees and provide a transportation infrastructure for timber removal. The former logging transportation network is occasionally used by people to gain access to the forest for low levels of selective resource extraction. New logging transport canal-building is rare as this labor-intensive construction cannot be accomplished by individual forest-users.

The impact of logging canals on peatland hydrology remains poorly understood. These transport canals, locally “tatah” meaning “carve” differ significantly in their characteristics compared to oil palm plantation drainage systems or “saluran” meaning aqueduct. Drainage canals in swamp conversion areas are constructed in dense grids along the natural grade for systematic and rapid water removal prior to plantation development. In contrast, logging canals, typically more narrow and shallow, form a loose, circuitous network across hydrologic flows in order to provide navigable pathways in peat swamp forest. These networks connect to primary canal routes that lead to a major river. The primary logging canals have been mapped for Rimba Raya (Figure 9) and will be targeted for management and monitoring as part of project implementation.

Local community land use information is based on both independent and formal community socialization stakeholder meetings held by InfiniteEARTH and its partners in each of the Project Zone villages. Data from these visits indicate that communities in the Project Zone are dependent on natural forests and rivers to obtain a number of basic needs including drinking water, fish, timber for building materials, and fuel wood. The Seruyan River is the most important source for meeting basic needs for water for drinking, washing, and sanitation purposes. The Seruyan is also vital for local transport. All communities appear to depend

very heavily on the Seruyan River fish stocks. Upstream tributaries are also used. Based on available data, communities appear to derive timber for local consumption primarily from community forest areas on the east side of the Seruyan, outside of both the Carbon Accounting Area and Project Zone. Fuel wood consumption is done on a subsistence level by collecting deadwood litter from secondary forests on the borders of the villages.

Local level agricultural land use has resulted in a number of forest fires throughout the project zone. Mostly these have occurred on a small scale. This happens primarily as a result of regular crop rotation cycles and traditional swidden agricultural practices where fire is used as a tool for clearing peat swamp forest land. Annually, crop areas are cleared and prepared manually by villages along either side of the Seruyan River as well as being distributed throughout most of the project zone. These fires regularly spread out of control and are left unmanaged to die out naturally. Like many other areas in Central Kalimantan Province, some areas of the Project Management Zone were heavily damaged by fires during the very long dry season of 1997-1998 (similar to area shown in Figure 10). Satellite imagery shows that extensive forest areas in and near the project area were burned during the 2006 El Niño drought year.

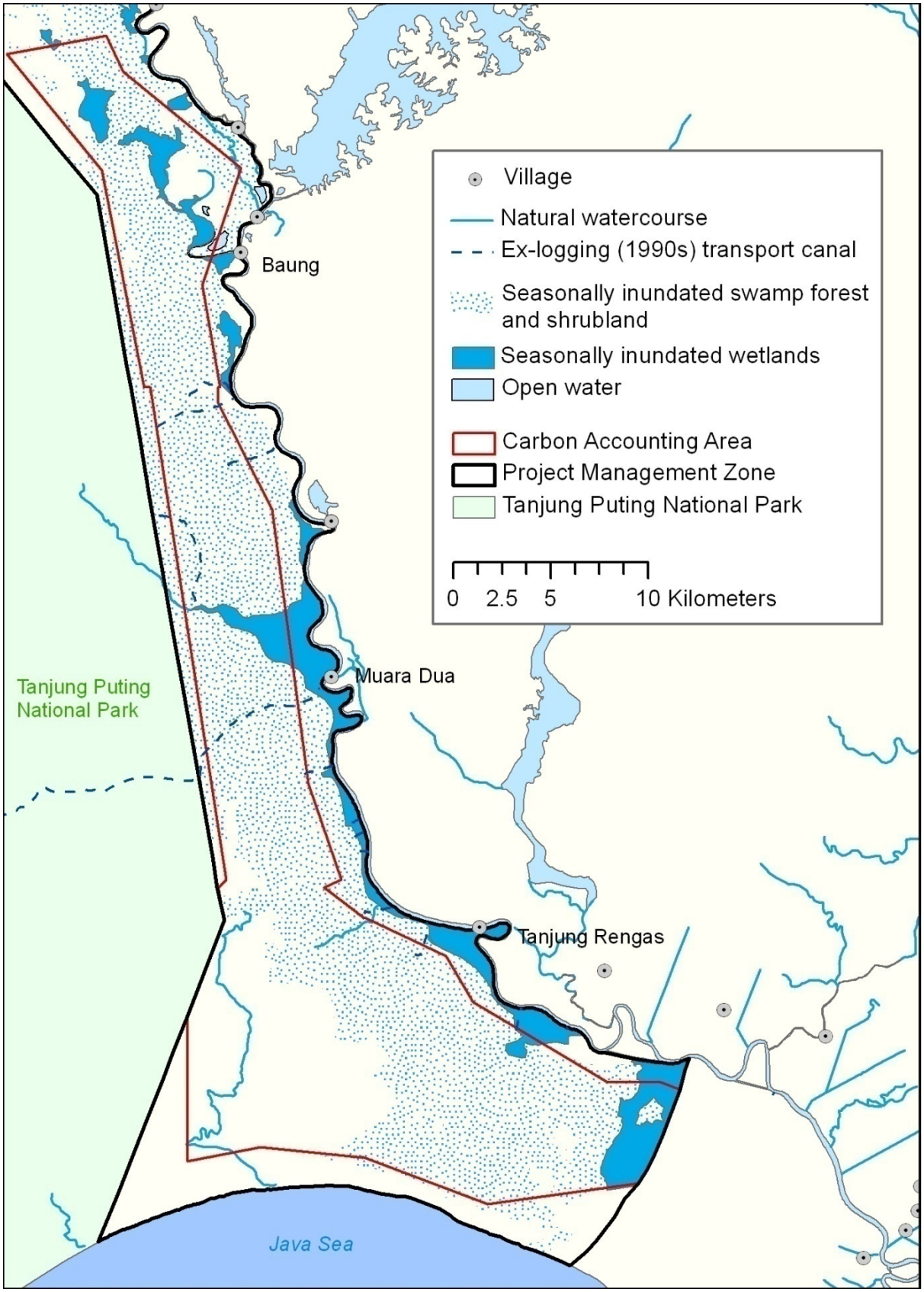


Figure 9. Small logging transport canals built to extract timber from illegal logging operations in the 1990s Canals shown with blue hatch lines.

Figure 10. Highly destructive fires that occurred in the project zone.
Anthropogenic fire is a regular occurrence needing to be controlled throughout the project zone. Fires often escape the control of their local agricultural purpose, spreading to forest and exposed peat areas. Peat areas become exposed when they are drained by canals (left). During dry seasons, these fires can spread across enormous areas (right).

1.7. A description of how the project will achieve GHG emission reductions and/or removal enhancements:

The Rimba Raya Reserve project will achieve greenhouse gas emissions reductions by avoiding the planned deforestation of peat swamp forest within the Carbon Accounting Area that was slated to be converted into oil palm plantations. The project will diverge from the baseline emissions scenario by obtaining and holding legal land tenure rights to the area for the sole purpose of ecosystem restoration. This will avert the planned forest clearing and peat land draining expected in the business as usual (BAU) scenario and thus mitigate the associated emissions resulting from those activities. The integrity of existing aboveground and belowground carbon will be maintained through a combination of fire prevention, forest conservation, and community development interventions to reduce remaining local level demands on forest resources.

Project carbon stocks will be protected through increased patrols by locally hired rangers to minimize fire ignitions and fire damage, halt all attempts to create new drainage or logging canals in the area, stop all land clearing and illegal logging and prevent encroachment of the neighboring palm oil plantation. A comprehensive fire management plan will be put in place in the Carbon Accounting Area and Project Management Zone, greatly reducing threats to project permanence and also supporting the capacity of project area ecosystems to continue natural carbon sequestration. Frequent monitoring of the reserve using satellite and aerial imagery combined with field patrols will allow project managers to respond quickly to new threats and work to preserve carbon stocks and prevent increased emissions in the reserve. Community development in the area will focus on environmental education and economic development that compliment the mission of the reserve by securing and maintaining community approval and cooperation in managing the reserve.

In addition to protecting the project area against any new activities that threaten to reduce carbon stocks or increase GHG emissions, the project will also actively monitor and manage project area forests and hydrology with the aim of providing additional benefit in terms of carbon sequestration and GHG emissions reductions. A preliminary reforestation plan has been developed for the Project Management Zone and programs will be developed and implemented to facilitate forest regeneration in recently burned and formerly logged areas and prioritize areas for active replanting. Project area hydrology will also be actively managed. The exit points of all logging canals on the Seruyan have already been mapped and their extent will be mapped and monitored in year two of the project. Small dams will be constructed on these logging canal exits to the Seruyan in years two and three of the project once the level of community support for the project has considerably strengthened. OFI and community members have already closed and dammed the largest of these, the “Tatah J”, in 2006. Project proponents will explore new methods of peat rewetting and

conservation[5] and will develop cooperative programs with regional research organizations and universities to focus additional research and conservation in the project.

1.8. Project technologies, products, services and the expected level of activity:

InfiniteEARTH brings a number of relevant technologies, products, and services to this project. These include: carbon stock assessment, aerial image collection, field patrols and infrastructure and fire prevention. These activities, described below, will be carried out by InfiniteEARTH teams and partner organizations and have been developed as a result of direct consultation with local communities and technical experts.

Carbon Stock Assessment

In mid-2009, carbon stock assessment surveys were undertaken using both ground and aerial survey techniques. Ground surveys made use of trained specialists and staff of Orangutan Foundation International (OFI) and Tanjung Puting National Park. Teams were divided into biomass and peat sub-teams to collect a number of measurements for the assessment of aboveground and belowground carbon stocks. Over the course of two months, eight permanent transects totaling 16.0 km in length were installed and surveyed throughout the Carbon Accounting Area. On these transects, a total of thirty-six 250m x 10m aboveground biomass plots were installed and surveyed (4 or 5 per transect representing a total of nine hectares).

Specialized biomass and peat sub-team were trained in field techniques including transect and plot layout with line and compass, tree diameter, height and canopy measurements with DBH tapes, clinometers, distance measures with a laser range finder, tree volume areas with Basal Area Factor prism and peat depth measurements with a specially designed peat probe. Team leaders were also trained in data recording and survey management. Operating SOPs and experienced field teams will ensure accurate and efficient monitoring during project field surveys.

Aerial Imagery Collection

The aerial imagery method is necessary when carbon stocks must be estimated over large and/or inaccessible areas of forest, which is the case for the Rimba Raya project area. In order to acquire these images, a plane owned and operated by InfiniteEARTH's technical partner, Forest Carbon, was flown over the project zone equipped with a full format digital camera (Nikon D700), Carl Zeis 50mm lens, a real-time differential correction geographic positioning system, laptop computer, hard disk drives capable of storing large amounts of data and a high frequency (4hz) GPS. Forest Carbon's system enables level images to be acquired every 8 second with exact GPS coordinates of the image to be attached to the metadata of hi-res photographs (10-15 cm per pixel resolution). This technique was used while conducting systematically spaced, overlapping parallel transects evenly distributed over the project boundaries. The image data was then processed by ERDAS-IMAGINE Leica Photogrammetry Suite Software to create a high resolution, geo-rectified, mosaic image across the project area. By measuring tree canopy diameters in 1 ha digital plots on high resolution images, and relating these data to ground measurements of tree canopy, aerial imagery can be used to estimate aboveground tree biomass across the project area.

Aerial surveys such as these can be used for both carbon monitoring and monitoring high risk areas for illegal logging activities. Examples of aerial photos in the project area are shown in Figure 11.

[5] The Rimba Raya Biodiversity Reserve Project plans to be a testing ground for future Voluntary Carbon Standards on Peat Rewetting and Conservation (PRC).

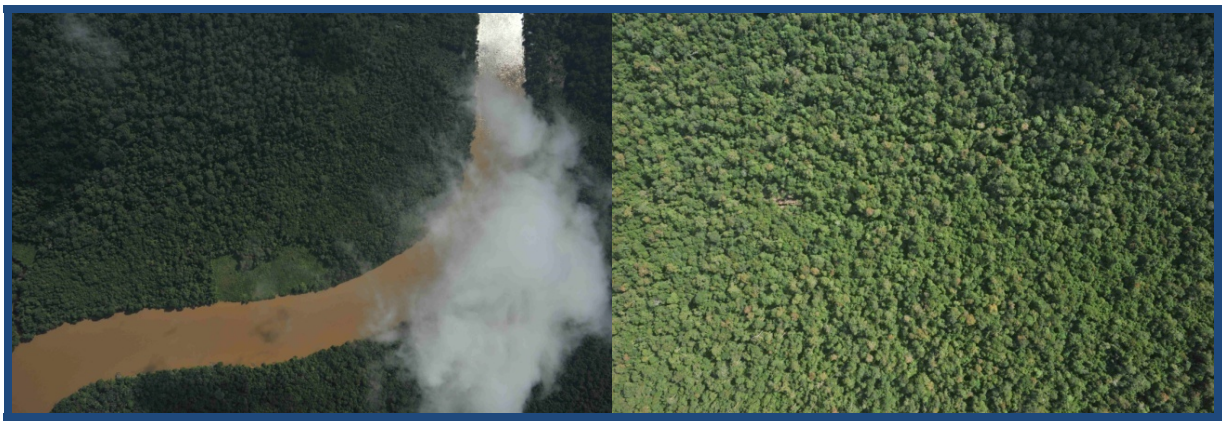


Figure 11. High Resolution Aerial Photography
These images were taken of the project area in mid-2009 for the baseline biomass assessment. These surveys will serve to be an important measurement tool for future monitoring events. A more complete set of images and an explanation of how they were used to calibrate other remote sensing data are explained in the Final Baseline Report.

Field Patrol Teams and Infrastructure

Field patrols, operated from guard posts in the Project Management Zone have been in operation by partner organization OFI since 2004. These patrols have been funded and directed towards monitoring by the project since 2008 and will be increased considerably in the first year post verification. Several key features underlie the effectiveness of these patrols:

- Experienced forest patrols and tracking teams: the project will fund OFI teams which have been effectively monitoring forest and tracking orangutans in Tanjung Puting National Park and the project area for 40 years. These teams routinely cover large expanses of remote peat swamp forest and are experienced in locating variable and unpredictable targets, using GPS and satellite image maps, carrying out interventions of illegal activity and conducting a range of biological, resource and social surveys. The project's operational plan includes regular patrols, on foot and by motorized canoe, throughout the Project Management Area on a daily basis.

- Community cooperation and participation. Rimba Raya patrol teams have a long history of cooperation and collaboration with communities and government agencies in the project and surrounding areas in managing and protecting forests. Patrol teams include many members from project communities and working together has strengthened local ties and support for the project. The project will build on these relationships by hiring and training additional fire and survey patrol team members, providing training and equipment and extending many project co-benefits to community members.

- Guard Posts and Fire Towers. The project currently funds the operation of five guard posts in and near the Project Management Zone and will build an extensive network of guard posts and fire towers in the first five years of the project. This infrastructure will provide staging points for routine field patrols, monitoring, interventions, surveys and daily presence in the Carbon Accounting Area and Project Management Zone.

- Radio communication and GPS. Radio communications are critical for information exchange between patrol teams, field team leaders and base camps in guard posts and the Pangkalan Bun office. OFI patrol teams have relied on radio communications to transfer information from the field team to managers at the office on a daily basis since 2002. This communication network will be expanded to equip all remote field teams with satellite radio and routine communications across the guard post and fire tower network.

- GIS support and data management. Spatial information and analysis are critical to carrying out operations in remote locations and has become a cornerstone of OFI operations over the last six years. The GIS team in the Pangkalan Bun office uses and manages a GIS database including satellite image data, and provides support to field teams by uploading and downloading data from GPS, digital cameras and survey forms, conducting GIS analysis and producing maps and reports. The project will expand the GIS team personnel, equipment and training to support its function as the central information exchange point for the project.
- SOPs and training. Team members are trained in field patrol procedures and protocols to ensure accurate and efficient data collection, transfer and archiving. Rimba Raya patrol teams currently use an SOP developed by OFI in 2006 to direct field patrols and an SOP developed by the project in 2009 to direct field surveys. Staff training was an important part of implementing these SOPs and will continue to be supported by the project as monitoring SOPs are refined and introduced.

Fire Prevention

InfiniteEARTH has developed a fire prevention and suppression plan for Rimba Raya Reserve that incorporates relevant government regulations and includes the participation of local communities, government institutions, and neighboring private plantations. The main tenet of InfiniteEARTH's approach to fire management is community involvement. Community-based fire management represents an innovative approach in which local communities actively participate and benefit from fire prevention and suppression activities. InfiniteEARTH will recruit, train, and employ local community members to prevent fires, conduct fire patrols and maintain fire breaks on the Carbon Accounting Area boundaries.

The fire management plan also calls for formal cooperative agreements with the Ministry of Forestry (BKSDA Division) and the Directorate of Estate Crops to develop a fire reporting system. As required by law, these relevant institutions will be kept abreast of all fire suppression activities in the Carbon Accounting Area through the submission of formal reports to the local government every 6 months. These reports will form the official record and will paint a clear picture of numbers of fire ignitions and the impact of each fire over time. Such reporting and subsequent analysis will ensure the continuous improvement of fire prevention and suppression activities to address fire causes, high risk areas, firefighting costs, and the effectiveness of different measures.

Project proponents have contracted with BKSDA division of the Forestry Department to oversee the community based fire prevention plan and they have already commenced training members of each village. BKSDA, while a government agency is also able to offer support and training to implement a comprehensive fire prevention and fire fighting program. Project Proponents contracted Techno Fire, one of the world's leading authorities on peat swamp fire prevention and suppression to design a plan to be implemented in conjunction with BKSDA's input and advice. **See Annex 3 for the complete Fire Plan and Implementation Schedule.**

The project proponent will also develop professional ties with fire prevention units of neighboring plantations which are legally obligated to organize fire prevention and fire suppression within their plantations. The main activities of InfiniteEARTH's fire prevention and management include:

- Development of Fire reporting System;
- Planting of fuel-breaks;
- Construction of fixed fire water tanks in areas without readily available water supplies;
- Construction of fire towers and accompanying guard posts to be staffed by trained fire-fighters;
- Development of programs to communicate fire policy changes and educate communities on the impact of unplanned fires on ecosystems and resources;
- Mapping the existing network of access trails and non-draining canals to allow for rapid fire response in remote areas of the Carbon Accounting Area;

- Providing maps, GPS units and training to fire patrol teams;
- Use of remote fire danger monitoring and rating systems hosted at the ASEAN Specialized Meteorological Centre of the National Environment Agency of Singapore and the Indonesian National Institute of Aeronautics and Space;
- Training and equipping of a local professional and volunteer fire prevention corps;
- Creation of a fire awareness and education program for schoolchildren; and
- Construction of low-impact, socially acceptable water reservoirs in strategic locations using existing non-draining logging canals logging canals and seasonal lakes.

1.9. Compliance with relevant local laws and regulations related to the project:

The Rimba Raya Biodiversity Reserve Project is committed to being in compliance with all international, national, and local laws and regulations relevant to project implementation. At the international level, the project will follow environmental and labor conventions ratified by Indonesia. With the employment of local community members, the project will follow Indonesian law UU No. 13/2003 which governs the relations between workers and employers.

The Project aims to obtain full government backing by following all necessary laws and regulations and by obtaining the relevant operational and business licenses required for land and land tenure. The project has been designed around these requirements. All land inside the Carbon Accounting Area is designated as federal government property and classified as "Production Forest" with overlapping zoning giving sub-concessionary rights for agricultural conversion.

The following national regulations related to the project area are of particular importance:

1. Ministry of Forestry Regulation No. P.6/Menhut-II/2009 regarding "Forest Layout and Preparation of Forest Management and Forest Utilization" dated January 8, 2007, as amended by Government Regulation No. 3 of 2008 regarding Amendment of GR No. 6 dated February 4, 2008
2. Ministry of Forestry Regulation No. P.61/Menhut-II/2008 "Regarding Provision and Application Procedure for the Granting of Business License for Forest Wood Utilization of Natural Forest in Production Forest" dated October 28, 2008.

Indonesian Laws Related to REDD Projects:

In May of 2009 the government of Indonesia began formal regulation of REDD projects with the creation of a REDD project procedural document. This procedural regulation gives a legal allowance for voluntary carbon market project development. The project is following these REDD procedures in accordance with the following listed regulations:

1. Ministry of Forestry Regulation No. P.68/Menhut-I/2008 on the Implementation of Demonstration Activities on Reduction of Emissions from Deforestation and Degradation.
2. Ministry of Forestry Regulation No. P.30/Menhut-II/2009 on The Procedures for Reducing Emissions from Deforestation and Forest Degradation (REDD), dated 1 May, 2009.
3. Ministry of Forestry Regulation No. SK.159/Menhut-II/2004 on Ecosystem Restoration in Production Forest Areas.
4. Ministry of Forestry Regulation No. P.6/Menhut-II/2007 concerning work plan and annual work plan of utilization of timber forest products in natural forest and ecosystem restoration in natural forest within a production forest.
5. Ministry of Forestry Regulation No. P.61/Menhut-II/2008 concerning provisions and procedures for the application and granting of a business license for wood forest products in a forest ecosystem restoration of natural forests in a production forest.

Fire Management on Forestry Concessions:

Fire management, an extremely important activity for ensuring permanence of the Carbon Accounting Area, is also required by law. The project proponent will also follow all government laws related to fire suppression activities and subsequent reporting.

1. Estate Crops: Law No. 18 of 2004, Article 25: Privates companies have obligation to organize fire prevention and fire suppression within their concessions.
2. Estate Crops: Law No. 18 of 2004, Article 26: Land clearing by fire is forbidden and severely punished by the Law.
3. Government regulation No. 45 of 2004, Art. 24: Concession must coordinate with relevant institutions and report to the Head of District on fire occurrence and undertaken fire suppression actions.
4. Government regulation No. 4 of 2001, Art. 15: Concession has to report on fire management activities at least every 6 months to the Governor/Head of District.

Carbon Rights Ownership in Indonesia:

Based on directives from the Indonesian Ministry of Forestry, in order for a company to engage in the trading of carbon of a government owned production forest it must apply for a Forest Product Utilization License – Ecosystem Restoration (IUPHHK-RE license). This license gives the concession holder ownership of the carbon rights.

The authorization process as laid out in government regulation "P61" is already under way and in the final stage of completion. Please refer to Section 8.1 Proof of Title for details on the current status of the license process.

1.10. Identification of risks that may substantially affect the project's GHG emission reductions or removal enhancements:

Fire poses the greatest risk to permanence in the Carbon Accounting Area**.** Best practices in forest and peat fire management will be taken to mitigate the incidence and spread of peat fires within Project Zone. This includes the detection and protection against fires originating immediately outside both the Project Zone and Carbon Accounting Area. InfiniteEARTH and its partners have constructed a detailed project management plan that includes a description of fire management practices.

Given that many fires are the result of the accidental spreading of community-based land clearing for agricultural activities, communities themselves also pose a risk to permanence at any given point in time. For this reason, as mentioned in Section 1.9.1, fire protection is an important part of community involvement and interaction. The project's approach of employing local community members to help manage and protect the project area seeks to further minimize loss of permanence. It is expected that local support for the project will be bolstered as benefits from carbon revenues flow directly into communities and as community members are directly engaged in developing projects that reduce their demands on forest resources. A detailed description of these activities is included in InfiniteEARTH's CCBA Project Design Document.

Project management related risks to permanence are addressed through the management and business expertise of InfiniteEARTH's core executive and management team. Activities within the Project Zone, which will be established as a permanent conservation reserve, will be managed by InfiniteEARTH partners who are experts on forest conservation management and fire prevention. Indirectly, risks to permanence will be further mitigated through the work of local community development organizations that have partnered with InfiniteEARTH to undertake community-level program management.

Non-Permanence Risk Analysis and Buffer Determination

This section follows the guidelines of the **Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination** and updates to this tool: **Update to the VCS 2007.1: Tool for AFOLU Non-Permanence Risk Analysis and Buffer Determination** 13 April 2010 and 8 September 2010.

The non-permanence risk analysis and buffer determination describes risk factors and ratings for All VCS projects(Table 3) and Avoided Planned Deforestation (APD) REDD projects(Table 4). Risk ratings and total risk for Rimba Raya were determined using the VCS Tools and are detailed in the tables below. In accordance with the methodology, this section is subject to the double approval process and risk rankings and buffer withholding recommended by both verifiers have been incorporated into this final assessment.

Table 3. Risk Factors for ALL VCS Projects

Risk factors for ALL VCS Projects		
Project Risk	**Risk Rating**	**Notes**
Risk of unclear land tenure and potential for disputes	Low	InfiniteEARTH will hold an Ecosystem Restoration Concession License over the project zones and area. This license will provide InfiniteEARTH usage rights for a period of up to 60 years with an option to renew for an additional 30 years beyond that.
Risk of financial failure	Low	The company has executed forward sales triggered upon the first verification that will create an endowment that will sufficiently fund the operational budget through an annuity for the entire life of the project and possibly in perpetuity. Confidential contracts and budgets will be shared with the validator.
Risk of technical failure	Low	No new technologies will be introduced that play a significant or vital role in the implementation of activities on the ground. Forest protection and monitoring activities on the ground invoke best practices from other protected and conservation areas utilized in other parts of Indonesia and internationally. Thus, risk of technical failure is low.
Risk of management failure	Low	InfiniteEARTH has established an experienced management team at the executive, managerial and operational field levels. Where key staff positions are not currently filled, a systematic plan for role and function of the remaining positions has been identified and the persons responsible for those duties in the interim period have been assigned. Apart from its core team, InfiniteEARTH has secured either partnerships or contractual agreements with relevant NGOs and expert consulting firms to support its core staff.
Economic Risk		
Risk of rising land opportunity costs that cause reversal of sequestration and/or protection	Low	Although rising land opportunity costs are expected to rise with the price of Oil Palm, the land tenure agreement held by InfiniteEARTH over the Rimba Raya area gives rights to the land for a period of up to 60 years with the opportunity to renew for an additional 30 years beyond that. While the government does have the right to cancel Ecosystem Restoration Concession Licenses, such cancellations can only result from evaluations of performance and a lack of compliance with required environmental impact assessments. Land opportunity costs are not a basis for license cancellation.

Regulatory and social risk		
Risk of political instability	Medium	In the post-Suharto era starting in 1998, Indonesia entered into a process of steady democratization. Since then Indonesia has maintained steady increasing political stability at national and regional levels and rapid political and commercial engagement with the West. Several national forestry sector policies decentralizing control of forest areas to local levels have been but under renewed central government control, in particular those regarding spatial planning and new national policies on Reducing Emissions from Deforestation and Degradation. With the re-election of President Susilo Bambang Yudhoyono in 2009, political stability in Indonesia is expected to continue to grow. While corruption at all levels continues to be an significant problem in Indonesia, the central government has taken strong steps to tackle the issue through the creation of the Corruption Eradication Commission (Komisi Pemberantasan Korupsi) Indonesia has received intense international attention specifically with respect to REDD, making it further accountable to achieve transparency and stability as a national process. InfiniteEARTH (IE) initially evaluated this to be a low risk factor. However, IE accepts the recommended medium risk rating for political instability at project initiation, given that positive trends in political stability and transparency have yet to be fully demonstrated. IE will monitor indicators of political stability and transparency, which are expected to continue improving in the near-term. IE anticipates that a low risk ranking for this component may be demonstrated in subsequent monitoring year evaluations.
Risk of social instability	Low	Since the end of the Suharto period, there has existed no history of large social unrest in or around the project area, the Province of Central Kalimantan or on a national level that would cause any significant risk to the project. InfiniteEARTH has focused intensively the mitigation of social conflict in the design and approach to community development in Rimba Raya. InfiniteEARTH has already begun to engage with local communities on the ground and involved them directly in project development activities. Local Government and community information gathering and sharing has been a central aspect of passing knowledge about the intentions, activities and benefits of the Rimba Raya project.
Natural disturbance risk		
Risk of devastating fire	Medium	The Rimba Raya project has been subjected to fires over its recent history. Much of this has been the result of human induced fires for agricultural land clearing. The drainage of the peat swamps creates conditions for intense and long burning fires. Thus, one of the driving carbon mitigation functions of the project is to avoid these fires from occurring. This is achieved through preventing the drainage of peat, and Puting in place a fire management system including fire watchtowers to rapidly detect, isolate and extinguish any fires that do occur. InfiniteEARTH (IE) initially evaluated this to be a low risk factor. However, IE accepts the recommended medium risk rating for risk of fire at project initiation, given that the fire program is in the process of being fully implemented. IE expects to be able to demonstrate the effectiveness of the Rimba Raya wildfire prevention and suppression program, following full implementation, so that a low risk rating can be re-evaluated after project initiation.

Risk of pest and disease attacks	Low	Pest and disease attacks are not believed to have been a historical issue in the Rimba Raya project area. Ecological surveys undertaken throughout the project lifetime are one method of detecting new invasive and destructive pests or diseases that may result in carbon loss from the project area through increased tree mortality.
Risk of extreme weather events (e.g. floods, drought, winds)	Low	Central Kalimantan is subject to seasonal shifts in precipitation. River flooding and mild drying of certain peat areas are the two common extremes of these weather patterns. Flooding presents limited risk to the project area, as it is comprised almost entirely of peat swamp forest areas that are already flooded seasonally. Extended droughts would present only indirect risk in that it would make the peat more vulnerable to fire. However, fire management programs that will be invoked as a result of this project will be present to manage such risk.
Geological risk (e.g. volcanoes, earthquakes, landslides)	Low	Extreme geological events in Indonesia are experienced regularly. Most notably regular earthquakes, landslides and the 2004 Tsunami. The Rimba Raya project area is of sufficient distance from coastal waters to be impacted by a Tsunami. Risks to the project from earthquakes and landslides are negligible. Borneo ranges are non-volcanic. Only one extinct volcano exists on the island and is situated in the far northern region of the island over 1,000 km away.
Total Risk Calculation	Medium[6]	InfiniteEARTH (IE) initially evaluated total risk to be low. However, IE accepts the recommended total risk rating of medium and agrees to the required buffer withholding of 20% at the initial project verification. IE plans to re-evaluate the medium risk rating in subsequent monitoring years following full project implementation and monitoring, with special attention to those components evaluated to be medium risk at project start up.

Table 4. Risk Factors and risk ratings applicable to Avoided Planned Deforestation (APD) REDD projects

Risk factors and risk ratings applicable to Avoided Planned Deforestation (APD) REDD projects		
Risk Factor	**APD Risk Rating[7]**	
Land ownership / land management type		
Land owned by private or public forest conservation organization with a good track record in forest conservation activities and able to obtain and enforce nationally recognized legal protection of the land	Medium	Land is owned by central government. InfiniteEARTH is seeking a license for ecosystem restoration that is valid for 60 years with an option for renewal for an additional 30 years. InfiniteEARTH has a partnership with Orangutan Foundation International (OFI) to undertake forest conservation activities. OFI has a long history of conservation, forest protection and orang-utan habitat management activities in the adjacent National Park, Tanjung Puting, to the west. InfiniteEARTH (IE) initially evaluated this to be a very low risk factor. However, IE accepts the recommendation to set the risk as medium for land ownership and management at initial project verification since IE does not own the land. The legal framework

[6] According to the VCS risk tool (VCS 2008) and the updates to the risk tool (VCS 2010a, 2010b) the highest rating determines the project's overall risk class and the required buffer withholding percentage shall be the maximum percentage in the buffer range for the determined risk class. Therefore, the total risk is assessed to be Medium and equal to a 20% withholding buffer.

[7] Classifications in accordance with VCS Guidelines on AFOLU Non-Permanence REDD Risk Rating for APD, Table 8, Pp. 9-10.

		and precedent for securing forest protection in Rimba Raya will be further investigated and presented in future re-evaluations of project risk, as it is IE's opinion that land protection and management can be sufficiently secured to warrant a low-risk rating in the future.
Land ownership and management dispute by local communities and/or stakeholders.	Low	Although land is legally owned by central government, local community traditional and customary use rights may arise. Land tenure and zoning is a contentious issue between national and community rights across most of Indonesia. In this case however, since the project does not dissuade or prevent normal community land uses, such as local level wood collection, hunting, fishing, use of agricultural lands, communities have few or no lost opportunity costs as a result of the project. Thus, it is possible, but unlikely that land ownership and management disputes will arise as a result of the project.
Technical capability of project developer/implementer		
No previous experience in the design and implementation of activities that may ensure the longevity of carbon benefits	Medium[8]	This is InfiniteEARTH's first project as an organization, however members of InfiniteEARTH team have extensive experience in designing and implementing several elements of the project activities. Additionally, InfiniteEARTH has the direct support of carbon forestry professionals with experience in the design of activities leading to the longevity of carbon benefits, as well as the support of partners with extensive experience designing and implementing the field portion of many project activities.

[8] InfiniteEARTH's implementing partners have exceptional experience and technical capacity in forest conservation and this partnership reduces risk. These partners bring extensive knowledge of conservation, forest protection and community development to the project, with long-term field experience in Rimba Raya specifically. InfiniteEARTH currently holds formal working agreements with three key implementing partners, these are:

a. **Orangutan Foundation International (OFI)** – InfiniteEARTH and OFI continue to collaborate on the implementation of forest monitoring, reporting and protection activities on the ground. The MOU has been in place since 2008.
b. **Word Education (WE)** – InfiniteEARTH has held an agreement with WE since 2009 to handle all grievances as an independent third party and to support and lead community projects, such as fisheries, education, health and government relations.
c. **BKSDA** (A Central Government Conservation department with broad powers in fire and forest security) – InfiniteEARTH signed an MoU with BKSDA in 2010 to train communities in community-based fire fighting and will expand this agreement to include forest patrols and protection.

Net revenues/financial returns from the project to ALL relevant stakeholders		
Lower than pre-project or lower than alternative land-uses	Low	It is reasonably assumed that alternative land-uses for the Rimba Raya area would be the conversion of the area for growing and harvesting palm oil. While Palm Oil produces high net revenues and financial returns for the palm oil company, benefits to local communities are limited. The Project proponents are delivering the same tax and royalty revenues for the land-use permit as would palm oil so there is no net loss to governments. Additionally, project proponents have demonstrated a wide range of tangible benefits to the communities (medical, agricultural, technical, etc) that deliver substantial benefits to the communities beyond anything offered by palm oil. Certainly, project benefits to OFI, a principle stakeholder, far exceed the losses it would suffer under conversion to palm oil.
Infrastructure and natural resources		
Low likelihood of new road(s)/rails being built near the REDD project boundary	Low	New roads may be built near the project boundary. This is likely to occur in the northern most region of the project area that is already converted for oil palm plantations. InfiniteEARTH (IE) initially evaluated this to be a very low risk factor since the concession license assures tenure and the patrol plan assures control of road invasion into the concession. However IE accepts the recommended low risk rating for new roads being built as the project is in the beginning stage of implementation. IE anticipates being able to demonstrate the appropriateness of a very low risk rating for this factor following project monitoring early in the project.
High-value non-forest related natural resources (oil, minerals, etc.) known to exist within REDD project area	Low	No non-forest related natural resources are known to exist within the REDD project area.
Palm Oil encroachment	Low	The only palm oil encroachment that could take place is from the plantation that occupies the northern notch of Rimba Raya and three years ago, OFI conducted a boundary check of the plantation and found that they had cleared some area outside of their plantation. This situation was reported in the newspapers and subsequently a meeting between OFI and PT Best representatives took place. Given the continued vigilance of OFI staff and additional staff from PT Rimba Raya, the risk of further incursion is low. The nearby oil palm plantations are owned by PT Best Agro, which could be rated as a mid-sized company that produces export-grade edible palm oil; and thus, are subject to pressure from conservation advocacy groups such as Greenpeace.
Illegal Logging	Low	Avoided planned deforestation methodology utilized for Rimba Raya does not account for community level logging. Some logging for community use will undoubtedly continue. However, logging to supply the communities' internal needs would in no way exceed the re-growth rate of the natural forest. Illegal logging that has taken place to generate cash income for villagers and middlemen will eventually be brought under control once the entire range of community support services are initiated by Infinite Earth.

Population surrounding the project area		
Decreasing or increasing, but with low population density (e.g., <50 people/km2)	Very Low	Local village populations are few and far between and are believed to be growing at a very low rate.
Incidence of crop failure on surrounding lands from severe droughts, flooding and/or pests/diseases		
Frequent (>1 in 10 years)	Low	Flooding on surrounding lands from intense wet seasons or fires could cause crops to fail, however communities are considered to have agricultural practices adapted to such risks or have alternative land options in neighbouring areas where practices could be temporarily relocated.
Project financial plan		
Credible long-term financial strategy in place (e.g., endowment, annuity-paying investments, and the like)	Medium	InfiniteEARTH has executed forward sales triggered upon the first verification that will create an endowment that will sufficiently fund the operational budget through an annuity for the entire life of the project and possibly in perpetuity. Confidential contracts and budgets will be shared with the validator. InfiniteEARTH (IE) initially evaluated this to be a low risk factor. However, IE accepts the recommended medium risk rating for the financial strategy at initial project verification given the current uncertainty about the compliance market for REDD credits. Through the sale of carbon credits after project verification, IE expects to be able to demonstrate sufficient financial security to achieve a low risk rating for this component at subsequent project verification.
General Risk of Fire		
Fire Risk	Medium	High fire return interval (<50 years) with adequate fire prevention measures in place
Total Risk		
Risk Ranking	Medium[9]	InfiniteEARTH (IE) initially evaluated total risk to be low. However, IE accepts the recommended total risk rating of medium and agrees to the required buffer withholding of 20% at the initial project verification. IE plans to re-evaluate the medium risk rating in subsequent monitoring years following full project implementation and monitoring, with special attention to those components evaluated to be medium risk at project start up.

*Despite the Low-Medium risk assessment by project proponents, an overall risk rating of Medium has been applied and a **20% Non-Permanence Risk Buffer** has been conservatively withheld against carbon stocks.

[9] According to the VCS risk tool (VCS 2008) and the updates to the risk tool (VCS 2010a, 2010b) the highest rating determines the project's overall risk class and the required buffer withholding percentage shall be the maximum percentage in the buffer range for the determined risk class. Therefore, the total risk is assessed to be Medium and equal to a 20% withholding buffer.

Risk Assessment in Subsequent Verifications

Risk rankings for most factors were assessed to be low for the Rimba Raya project: 9 low-risk versus 2 medium-risk factors applicable to all projects, and 8 low-risk versus 4 medium-risk factors applicable to REDD projects. However, in accordance with the VCS Non-Permanence Risk Analysis and Buffer Determination Tool and Updates, the highest rating determines the project's overall risk class. Therefore, the conservative medium risk rating is applied to the project. Further, while the available buffer withholding range for medium risk projects is 10% - 20%, the maximum percentage is applied to the project for withholding.

This conservative approach is appropriate in general, as REDD projects are yet in their infancy. However, project proponents believe the inherent risk to project permanence is low for Rimba Raya for a number of reasons briefly described in the tables above. Following full project implementation and through demonstrated project stability in initial project years, project proponents plan to reassess risk in subsequent verifications with the potential to re-evaluate the 20% buffer determination set in the first project verification.

1.11. Demonstration to confirm that the project was not implemented to create GHG emissions primarily for the purpose of its subsequent removal or destruction.

The fundamental basis of the Rimba Raya Biodiversity Reserve Project is to avoid planned deforestation and peat drainage. By its nature, this project does not create any new GHG emissions as a by-product that could subsequently be removed. Hence there is no possibility for secondary or "downstream" removal or destruction of produced GHG emissions.

1.12. Demonstration that the project has not created another form of environmental credit (for example renewable energy certificates).

The Rimba Raya project is not participating in activities that would generate another form of environmental credit.

1.13. Project rejected under other GHG programs (if applicable):

The Rimba Raya project has not been rejected under any other GHG reduction programs.

1.14. Project proponents' roles and responsibilities, including contact information of the project proponent, other project participants:

InfiniteEARTH is the principal project proponent, responsible for the design and implementation of the project via its local operational entity, PT. Rimba Raya Conservation. A number of other institutions are involved in implementing specific programs or components of the project. The primary responsibilities and skill sets and the organizational structure are elaborated in Table 5.

Table 5. Roles and responsibilities of project proponent and associates

Entity	Description	Function
InfiniteEARTH Suite-8/A, The Ritz Plaza 122 Austin Road, Tsim Sha Tsui Kowloon, Hong Kong Contact: Todd Lemons Email: contact@infinite-earth.com Web:www.infinite-earth.com	**Infinite-Earth** is a company dedicated to the development of economically viable solutions to climate change and environmental degradation by addressing the underlying drivers of deforestation - poverty. The company's projects are internally mandated to go "Beyond Carbon and Beyond Sustainability". To that end, Infinite-Earth projects focus on the preservation of Endangered Species Habitat, High Conservation Value Forests, and the protection of National Parks through the creation of social and physical buffer zones. Additionally, projects are designed to meet the UN Millennium Development Goals by funding sustainable development of rural communities through capacity building and technology transference of low impact technologies such as solar, fuel efficient cook stoves, aquaponics, agro-forestry "jungle crops", and social benefits programs such as health care, early childhood education materials and tools such as "One Laptop per Child". The company was founded and is staffed by a group of seasoned professionals from broad multi-disciplinary backgrounds including: International Project Development, Sustainable Forestry, Conservation, Tropical Forest Ecology, Remote Sensing, GIS, Carbon Science, Finance and Marketing.	**Forest Protection, Carbon Monitoring, Project Management, Community-based Enterprise Development, Carbon Sales**
Orangutan Foundation International (OFI) Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111 Indonesia Contact: Dr. Biruté Galdikas Tel: +62 0532-24778	**Orangutan Foundation International** is a nonprofit organization dedicated to the conservation of wild orangutans and their rainforest habitat in Indonesia and Malaysia. Founded in 1986 by scientist and conservationist Dr. Biruté Mary Galdikas and her former doctoral student, Dr. Gary Shapiro, OFI focuses on three objectives: research, conservation, and education. OFI also disseminates information about the orangutan to galvanize policymakers and the public toward an appreciation of orangutans and their highly endangered status. For more than three decades Dr. Biruté Mary Galdikas has studied and worked closely with the orangutans of Indonesian Borneo in their natural habitat, and is today the world's foremost authority on the orangutan. OFI will continue to provide a long-term local presence to the efforts of the Rimba Raya project and their function will be to continue to do what they have done for 40 years – protect orangutan habitat.	**Forest Protection, Ground Surveying**
Forest Carbon Jalan Kemang Selatan VIII, #5A Kemang Jakarta Selatan75123 Indonesia Contact: Scott Stanley Email: info@forest-carbon.org Web: www.forest-carbon.org	**Forest Carbon**, a consulting firm was formed in early 2007 to address the need for a highly technical and regionally focused organization in Indonesia. Forest Carbon provides technical and project development services for carbon baseline measurement, project design, implementation, and monitoring of carbon forestry projects for the voluntary and compliance markets on REDD and Improved Forest Management. Forest Carbon is comprised of a core team of experts with extensive Indonesian experience in the fields of silviculture, tropical ecology, GIS/remote sensing, and social forestry. Key staff members in Forest Carbon have been actively working in the carbon forestry space in Indonesia since 2006. They have worked extensively on some of Indonesia's earliest projects for the voluntary (VCS and CCBA) and pre-compliance markets (REDD) for both non-profit organizations and private sector project developers.	**Carbon Baseline, Ground Surveying, Carbon Monitoring**
Winrock International 2121 Crystal Drive Suite 500 Arlington, Virgina22202 United States of America Contact: Nancy Harris Email: information@winrock.org Web:www.winrock.org	**Winrock International** is a leading voice and active participant in the global environment and climate change arena. For over a decade, Winrock has been the organization trusted worldwide to bring the most cutting edge, proven information and services for greenhouse gas assessment in agriculture, forestry, and other land uses. Ecosystem Services fulfills Winrock's mission by developing innovative approaches to carbon estimation and disseminating this information to organizations and communities worldwide so they can participate in new markets. Winrock International was created in 1985 with the merger of three institutions: the International Agricultural Development Service, the Winrock International Livestock Research and Training Center, and the Agricultural Development Council (A/D/C).	**Carbon Methodology**

PT Daemeter Consulting Jl. Tangkuban Perahu No.6 Bogor, Jawa Barat 16151 Indonesia Contact: Gary Paoli Email: info@daemeter.org Web:www.daemeter.org	**PT Daemeter Consulting** is an independent firm based in Bogor, Indonesia, specializing in the provision of technical services to promote responsible management of forest and agricultural landscapes. Daemeter has expertise in social, ecological and political dimensions of sustainability in Indonesia, with emphasis on High Conservation Value identification and management - Social and cultural surveys - Public consultation and stakeholder engagement - Ecosystem mapping using remote and field based methods - Biodiversity surveys - Certification mentoring.	**Biodiversity Monitoring**
World Education World Education Jalan Tebet Dalam IV-D Number 5A Jakarta 12810 Indonesia Contact: Handoko Widagdo Email:weindo@indo.net.id Web:www.worlded.org	**World Education** is well known for its global work in environmental education, community development, maternal and child health, school governance, integrated literacy, small enterprise development, and refugee training. Since its founding in 1951, World Education has worked in over 60 countries in all regions of the world to provide training and technical assistance in many sectors. World Education supports the development of many types of indigenous non-governmental organizations (NGOs) and community-based organizations (CBOs) to achieve long-term results.	**Social and Agricultural Education,** **Community-based Enterprise Development**
Potters for Peace P.O. Box 1043 Bisbee, Arizona 85603 520-249-8093 United States of America Contact: Peter Chartrand E-mail:peterpfp@gmail.com Web:www.pottersforpeace.org	Since 1998, **Potters for Peace**, a member of the World Health Organization's International Network to Promote Household Water Treatment and Safe Storage, has been assisting in the production worldwide of a low-tech, low-cost, colloidal silver-enhanced ceramic water purifier (CWP). Field experience and clinical test results have shown this filter to effectively eliminate approximately 99.88% of most water born disease agents.	**Social and Agricultural Education,** **Community-based Enterprise Development**
MBK Ruko Asiatic Blok B 15/59 Jalan Permata SariLippo Karawaci Barat KabupatenTangerang 15810 Indonesia Contact: Dr. Shafiq Dhanani Email:shafiq.dhanani@mbk-ventura.com Web:www.mbk-ventura.com	**MBK** (Mitra Bisnis Keluarga) stands for "Family Business Partners". MBK is a non-bank financial company (NBFC) regulated by the Ministry of Finance and with a venture capital license issued in November 2006. Using the classic Grameen Bank methodology, MBK provides working capital to low-income households in Indonesia in order to raise their family incomes and living standards.	**Community-based Enterprise Development**
Health in Harmony Health In Harmony 4110 SE Hawthorne Blvd, #246 Portland, Oregon 97214 United States of America Contact: Kinari Web Email:kinariwebb@healthinharmony.org Web:www.healthinharmony.org	**Health in Harmony** supports an innovative program in West Kalimantan, Indonesia, that partner with local communities to integrate high quality, affordable Health care with strategies to protect the threatened rain forest.	**Health & Immunization Programs**

1.15. Any information relevant for the eligibility of the project and quantification of emission reductions or removal enhancements, including legislative, technical, economic, sectoral, social, environmental, geographic, site-specific and temporal information.):

No additional information

1.16. List of commercially sensitive information (if applicable):

Any commercially sensitive information that has been excluded from the public version of the VCS PD that will be displayed on the VCS Project Database shall be listed by the project proponent.

- VERPAs (forward sales contracts)
- Detailed Financial Models (P&Ls and Cash Flow Analysis) demonstrating the financial viability of the project

2. VCS Methodology

2.1. Title and Reference of the VCS Methodology applied to the Project Activity and explanation of methodology choices:

The methodology for this project follows the Approved VCS Methodology ***"VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1-0".***The full report[10] of the methodology should be used as a reference when reading this section along with the Final Baseline Emission Estimate for the PT Rimba Raya Restoration Concession[11]. The methodology completed the VCS double approval process under **VCS 2007.1** (including subsequent updates) by the Rainforest Alliance and Bureau Veritas Certification[12]

Conceptual diagrams of methodological pathways with equations and tables of data/parameters are included in Section 3.3 (project monitoring), Section3.6 (leakage monitoring) and Section 4.5 (baseline GHG emissions). Assumptions and decisions are described in diagram notes and parameter tables.

A deviation to the methodology in Aerial Image Method (AIM) steps is detailed in the methodological pathway diagram for baseline GHG emissions. Briefly, equations 23, 24 and 25 reflect a deviation in tree height and crown area field measurements, neither of which was used in biomass modeling. The best-fit linear regression showed longest side of crown (not crown area) was the best predictor of DBH, which produced a deviation in equation 28. Tree biomass was estimated using the Broadbent et al. (2009) regression equation (deviation in Eq.. 30) using tree crown areas digitized in virtual plots. This model performed better than the allometric model using DBH.

It is expected that the deviation in AIM steps had a negligible effect on baseline calculations since methods used are consistent with prescribed methods. The Broadbent et al. biomass equation produced lower biomass estimates than the allometric equation, so any effect may be considered conservative.

The majority of the Rimba Raya project area contains peat swamp forest with average peat depth exceeding 2 meters and was planned for conversion to oil palm estates. Proposals for establishing four estates that overlap with Rimba Raya boundaries were sent to the Seruyan Regent and the initial location permits needed for conversion were granted for at least two of the proposed estates. Investigations by OFI indicated that the principal shareholder for these proposed estates is PT BEST Agro International, a large

[10] Methodology accessed September 30, 2010 at http://www.v-c-s.org/VM0004.html
[11] Baseline Calculations for Rimba Raya_2010.12.30
[12] Assessment reports may be accessed at http://www.v-c-s.org/VM0004.html

palm oil conglomerate with established plantations on the northeast border of Tanjung Puting National Park. This company is already operating a newly established oil palm estate that penetrated into the original northern proposed border of Rimba Raya, and subsequently caused the project boundary to be redrawn.

2.2. Justification of the choice of the methodology and why it is applicable to the project activity

The project activity of peat swamp forest conservation is taking place in an area that was slated for conversion to palm oil plantations by the Indonesian government. Without the project, the Carbon Accounting Area would have been deforested and drained, releasing vast amounts of CO_2 into the atmosphere. The selected methodology is currently the only VCS-approved methodology for avoided deforestation in tropical peat swamp forests and was designed based on Central Kalimantan peat swamps in particular.

Conditions in Rimba Raya meet all the applicability criteria listed in the approved methodology. These criteria and a description of how they are met by the project are presented in Table 6.

Table 6. Applicability Criteria

Applicability Criteria	Description and References of how project meets Applicability Criteria
A. The methodology was developed for (and is applicable to) preventing land use change on undrained tropical peat swamp forests in Southeast Asia only; it is not applicable to peatlands in other regions or climatic zones (boreal peat bogs, etc.) or to previously drained peatlands. Forest shall be defined according to the host country's forest definition as agreed upon under UNFCCC participation that includes minimum thresholds for area, height and crown cover. Peat shall be defined as organic soils with at least 65% organic matter and a minimum thickness of 50 cm^2.	The project is located on an undrained tropical peat swamp forest in Southeast Asia between 112°01'12 "- 112°28'12" east longitude and 02°31'48"- 03°21'00" south latitude. The Ministry of Forestry mapped the project area as undeveloped peat swamp forest with varying levels of degradation. Project-specific landcover analysis confirmed and updated Ministry of Forestry mapping (Bolick 2009a). In Indonesia, forest is defined as follows: land area of at least 0.25 ha, 30 percent crown cover and 5 m tree height (Ministry of Forestry, 2004). Wetlands International (2004) mapped the entire project area as shallow peat. Carbon surveys (Bolick 2009b, 2009c) confirmed the extensive distribution of peat and documented an average peat depth of >3 meters. The peat survey (Dwiastuti et al. 2010) showed the peat soils contained at least 65% organic matter.
B. The application of the procedure for determining the baseline scenario in Section 6 leads to the conclusion that baseline approach (c) is the most appropriate choice for determination of the baseline scenario (see Kyoto Protocol Decision 5/CMP.1 paragraph 22).	The procedure for determining the baseline scenario was applied as described in section 2.5 of the VCS PD. The application of this tool produced the conclusion that baseline approach 22(c) from the Kyoto Protocol Decision 5/CMP.1 is the most appropriate choice for determination of the baseline scenario. This decision takes into account national, sectoral, and local policies influencing the land use prior to the start of the project activity; the scope of project alternatives relative to the baseline; and barriers to implement the avoided deforestation project activity. This approach, which is adopted by the methodology, is: "Changes in carbon stocks in the pools within the project boundary from the most likely land use at the time the project starts."

C. The methodology is applicable only for avoiding complete conversion of peat swamp forests to another known land use; it is not applicable for avoiding forest degradation. It is assumed that land preparation during the conversion of peat forest would have removed all existing aboveground biomass stocks through logging and/or burning.	The project area was slated for complete conversion to palm oil as shown in provincial planning maps (presented in sections 1.5 and 2.5 of this document). Four concessions covering the carbon accounting area had been granted to a well-known deforestation agent (PT BEST) with industrial oil palm estates immediately to the north of the project area. This well financed agent uses industrial / mechanical slash (bulldozers) and burn techniques to clear land in preparation for planting. Review of satellite imagery and analysis of historical land conversion by PT. BEST (described in this document section 4.2) confirmed that all existing aboveground biomass stocks are removed during palm oil estate development.
D. The methodology is applicable only for preventing planned land use conversion in known, discrete parcel(s) of peatland, not for deforestation trends that follow a frontier approach. The land use conversion avoided must be in areas officially and legally designated for and under direct threat of such conversion, and the area and specific geographic location of all planned land use conversions in the baseline must be known and come from written documentation including land use conversion permits, government records, concession maps, etc. Planned deforestation must be projected to occur within ten years of the project start date.	The carbon accounting area matches the discrete parcels of proposed palm oil concessions shown in official government maps issued by the department of forestry. In the absence of the project, deforestation would have already occurred in year one of the project, with total conversion occurring within ten years of the start date or sooner. Review of satellite imagery and analysis of historical land conversion by the deforestation agent confirmed that the entire concessions boundary is cleared during palm oil estate development as described in this document section 4.2.
E. The methodology is applicable only for avoiding land use change that would be caused by corporate or governmental entities (plantation companies, national or provincial forestry departments, etc.) and not by community groups, community-based organizations, individuals or households.	The primary deforestation agent is an industrial conglomerate (PT BEST Group). This corporate entity was driving planned deforestation and land use change in the project area. Local, provincial and national government policy and common practice facilitated and accelerated conversion to palm oil in the region. In summary, this project avoids land use change by a corporate entity facilitated by government policy and practice, not by community groups, community-based organizations, individuals or households.
F. Peat drainage emissions in the baseline scenario shall be calculated using a net peat drainage depth of no more than one meter.	The baseline scenario was calculated using a net peat drainage depth of 1 meter as shown in the Baseline calculations spreadsheet and as referenced in the description of methodological parameters in this document (see Table 20).
G. Carbon stocks in dead wood and litter can be expected to further decrease (or increase less) in the absence of the project activity during the time frame that coincides with the crediting period of the project activity.	Carbon stocks in dead wood and litter would be expected to decrease substantially in the absence of the project by being burned as part of forest conversion to palm oil. This would be expected to occur within the first eight years of the baseline scenario based on the conversion rate assessment (see section 4.2 of this document), thus this is within the time frame of the crediting period.

H. The parcel(s) of peat swamp forest to be converted to another land use must not contain human settlements (towns, villages, etc.) or human activities that lead directly to deforestation, such as clearing for agriculture or grazing land. Activities that involve the utilization of natural resources within the project boundary that do not lead to deforestation are permitted (e.g., selective logging, collection of NTFPs, fuelwood collection, etc.) as this degradation is accounted for in the monitoring methodology.	There are no settlements within the Carbon Accounting Area (CAA) or the surrounding Project Management Zone (PMZ), which serves as a buffer to the project. Communities, including 14 villages, are located adjacent to the PMZ and some residents utilize natural resources in the project area to meet subsistence needs. None of the activities lead to deforestation and all are related to selective logging and collection of forest products. Degradation associated with these activities is accounted by the monitoring methodology and documented in annual monitoring reports.
I. The biomass of vegetation within the project boundary at the start of the project is at steady state, or is increasing due to recovery from past disturbance, and so monitoring project GHG removals by vegetation can be conservatively neglected if desired.	The project area has historically suffered degradation by fire and selective logging, and is now at steady state or in the process of natural recovery. Ongoing biomass accumulation is conservatively neglected in carbon accounting for the project scenario as allowed by this applicability criterion and as noted in the Baseline Report and VCS PD.
J. The volume of trees extracted as timber per hectare prior to land conversion in the baseline is conservatively assumed to be equivalent to the total volume (or biomass) of all trees of commercial value above the minimum size class sold in the local timber market.	In the baseline calculations, the volume of trees extracted as timber per hectare is assumed to be equivalent to the total volume of all commercially valuable trees ≥ 30 cm, which is the minimum size class sold in the local timber market. The size limit and definition of merchantable timber for solid wood production is legally defined and regulated by the license of Forest Utilization. The regulation is quoted below: Minister of Forestry Regulation Number: **P. 11/Menhut-II/2009:** Silvicultural System on the Area of Business License on Wood Forest Products Utilization in Production Forest. Article 8. Cutting cycle and diameter limit of cutting referred to in paragraph (2) is: a. On dry land forest land: (1) 30 (thirty) years with diameter limit ≥ 40 cm (forty centimeters) in production forest area or convertible forest area, and ≥ 50cm (fifty centimeters) in limited production forests with the TPTI or TR silviculture system. (2) 25 (twenty five) years for the TPTJ silvicultural system with 3 (three) meters line plantation of ex clear-cutting forest with diameter limit ≥ 40 cm (forty centimeters). b. 40 (forty) years for **diameter limit ≥ 30 cm** (thirty centimeters) in **swamp forests**. Merchantable timber was estimated to be 36% of total biomass in trees ≥ 30cm based on the Mawas logging gap dataset. This value is used in the baseline to calculate the total amount of extracted timber and corresponding carbon stocks that would not have been subsequently burned.

K. The project boundary shall be hydrologically intact such that the project area is not affected by drainage activities that are occurring outside the project area in a defined buffer zone (if applicable) at the start of the project (as detected from satellite or other remote sensing imagery). Both the project boundary and the buffer zone (if applicable) shall be monitored for new drainage activities over the life of the project. The width of the buffer zone to be monitored shall be set to a default value of 3 km from the edge of the project boundary or the distance to the edge of the peat dome, whichever is smaller. The monitoring methodology accounts for the impacts of future drainage activities that occur within the project boundary, but if future monitoring detects significant new drainage within the buffer zone (such as that associated with new canals designed for transportation by boat or for developing plantations), then this methodology is no longer applicable in its current form and it shall be revised to take into consideration the extent of the outside drainage activity's impact on GHG emissions occurring within the project boundary. This drainage impact shall be determined using a combination of hydrological modeling and field measurements and shall be done in collaboration with at least two peat experts. If new scientific findings suggest influences for which the prescribed buffer zone would not offer effective separation between the project boundary and external drainage activities, the methodology should be revised to reflect a revised buffer width.	The project boundary is hydrologically intact and includes one buffer zone set to a default value of 3 km from the northern edge of the project boundary. This buffer was established after the project start as required by the methodology and separates the project from one drainage canal at the southernmost end of the already-developed ex-KUCC palm oil plantation. The monitoring methodology and plan includes remote and ground-based survey and detection of any new drainage activity and accounts for the impacts of any such future activity.
L. The total land area allocated to the deforestation agent for planned deforestation must be shown not to have increased solely for the purpose of eliciting REDD credits.	The deforestation agent is a well-established company dating back to the 1980s and has no connection to the project proponents. Additionally, the concession areas were granted to the agent several years before the project proponent ever visited Indonesia for the first time. There is a well-documented battle between the agent and Orangutan Foundation International (OFI) over the exploitation vs. conservation of the project area, which lies adjacent to Tanjung Puting National Park (Smith et al. 2006). Maps of the region, show that the deforestation plans of PT BEST were status quo for the Seruyan Regency (see Figure 3) and Central Kalimantan Province (see Figure 20) which had plans to convert extensive land and forest areas to palm oil.

2.3. Identifying GHG sources, sinks and reservoirs for the baseline scenario and for the project:

The major carbon pools subject to project activity are peat and aboveground tree biomass (Table 7). Since the baseline scenario conservatively assumes that the area would have been logged for timber; long-lived wood products were also included in carbon pool calculations as required by this methodology. Aboveground non-tree biomass, deadwood, and litter have been demonstrated to make small but positive contributions to the carbon pool and were conservatively excluded from baseline calculations.

Table 7. Selection of Carbon Pools examined in baseline scenario and for the project

Carbon Pools	Selected Yes/No	Justification / Explanation of Choice
Aboveground tree biomass	**Yes**	Major carbon pool subject to the project activity.
Aboveground non-tree biomass	No	This is an insignificant carbon pool (<0.5%) based on field surveys and is conservatively ignored based on the application of the A/R Tool titled "Tool for testing significance of GHG emissions in A/R CDM project activities"
Belowground biomass	No	It is assumed that belowground biomass is included in the peat component. Additionally, root to shoot ratios for peat swamp forests are highly uncertain.
Deadwood	No	Conservative approach under applicability condition.
Litter	No	Conservative approach under applicability condition.
Peat	**Yes**	Major carbon pool subject to the project activity
Soil Organic Carbon	No	The soil component is included in the peat component
Wood Products	**Yes**	Removal of timber is associated with deforestation in the baseline, and significant quantities of carbon can be stored in long-term wood products rather than being emitted into the atmosphere. Thus the quantity of live biomass going into long-term timber products in the baseline scenario is included

The methodology uses the A/R Tool titled "Tool for testing significance of GHG emissions in A/R CDM project activities" to exclude litter from the list of major carbon pools subject to project activity. The same tool was used to test for significance of the non-tree biomass carbon pool in Rimba Raya. This tool states that "The sum of decreases in carbon pools and increases in emissions that may be neglected shall be less than 5% of the total decreases in carbon pools and increases in emissions, or less than 5% of net anthropogenic removals by sinks, whichever is lower." Non-tree biomass was surveyed in 150 small plots in the project and was found to contribute <0.5% to total GHG emissions (an order of magnitude less than the A/R CDM Tool minimum value). Therefore, this carbon pool was deemed to be an insignificant emission and was conservatively excluded from Baseline calculations. This assessment is presented in the field biomass survey section of the Baseline Report.

Table 8 summarizes GHG emissions examined for the project. Emissions in peat swamp normally occur due to fire, man-made drainage, and through extractive or conversion activities, and occasionally could occur due to extended droughts. Of the sources of emissions, those from drainage produce the highest CO2 levels. Since the baseline scenario indentifies conversion to oil palm plantations, it was assumed that fire and peat drainage would occur. In this region of Kalimantan, fire is almost universally used by plantation developers to prepare the site for planting, since this is the most economical method and large population centers that would object to the smoke are absent. This assumption is consistent with the methodology, which provides guidance on how to calculate the GHG emissions associated with these activities.

Table 8. GHG emissions by sources and sinks

Sources	Gas	Included/Excluded	Justification/ Explanation of Choice
Burning of aboveground biomass	CO_2	**Excluded**	However, carbon stock decreases due to burning are accounted as a carbon stock change
	CH_4	**Included**	Non-CO_2 gas emitted from biomass burning

	N_2O	**Included**	Non-CO_2 gas emitted from biomass burning
Peat oxidation from drainage	CO_2	**Included**	Main gas of this source
	CH_4	**Excluded**	Drainage has been shown to have a small effect on CH_4 emission budgets (X); the highest proportional CH_4 flux forms only ,0.2% of the CO_2 emissions in drained peat soils.(xy)
	N_2O	**Excluded**	Potential emission is negligibly small (xy)
Burning of peat	CO_2	**Included**	Emissions are accounted using an emission factor
	CH_4	**Included**	Non-CO_2 gas emitted from peat burning; emissions are accounted using an emission factor
	N_2O	**Excluded**	N_2O is not typically a measure trace gas emission from peat burning (x); potential emission differential between natural and burned peat is negligible (x)

2.4. Description of how the baseline scenario is identified and description of the identified baseline scenario:

- *The project proponent shall select the most reasonable baseline scenario for the project. This shall reflect what most likely would have occurred in the absence of the project.*

As required by the approved methodology, the most current version of the *"VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities"*[13], was used to determine the most plausible baseline scenario. Step 1 of this tool was used to identify and select the baseline scenario through a series of sub-steps, presented with documentation in section 2.5 below.

Of the alternative scenarios identified for the project, complete conversion of the peat swamp forest to palm oil plantations was determined to be the most plausible scenario to occur in the absence of the project, and was therefore selected as the baseline scenario.

2.5. Description of how the emissions of GHG by source in baseline scenario are reduced below those that would have occurred in the absence of the project activity (assessment and demonstration of additionality)

To assess and demonstrate additionality, project proponents applied the most current version of the *"VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities*".[14] The four-step process for determining additionality is illustrated in Figure 12 and described below.

After identifying alternative land use scenarios and determining the baseline scenario (Step 1, described in section 2.4 above), Steps 2-4 were carried out to determine whether the reduction in emissions gained by implementing the project is additional to the most likely business-as-usual scenario. The results of applying the step-wise approach is presented below together with documentation and supporting data, which clearly demonstrate additionality. That is, the project activity (conservation of peat swamp forest) reduces GHG emissions in the baseline scenario (conversion of peat swamp forest to palm oil) and is therefore determined to be additional.

[13] VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities.pdf last accessed December 8, 2010 at http://wBw,itw.v-c-s.org/docs/VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities.pdf

[14] VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities.pdf last accessed December 8, 2010 at http://wBw,itw.v-c-s.org/docs/VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities.pdf

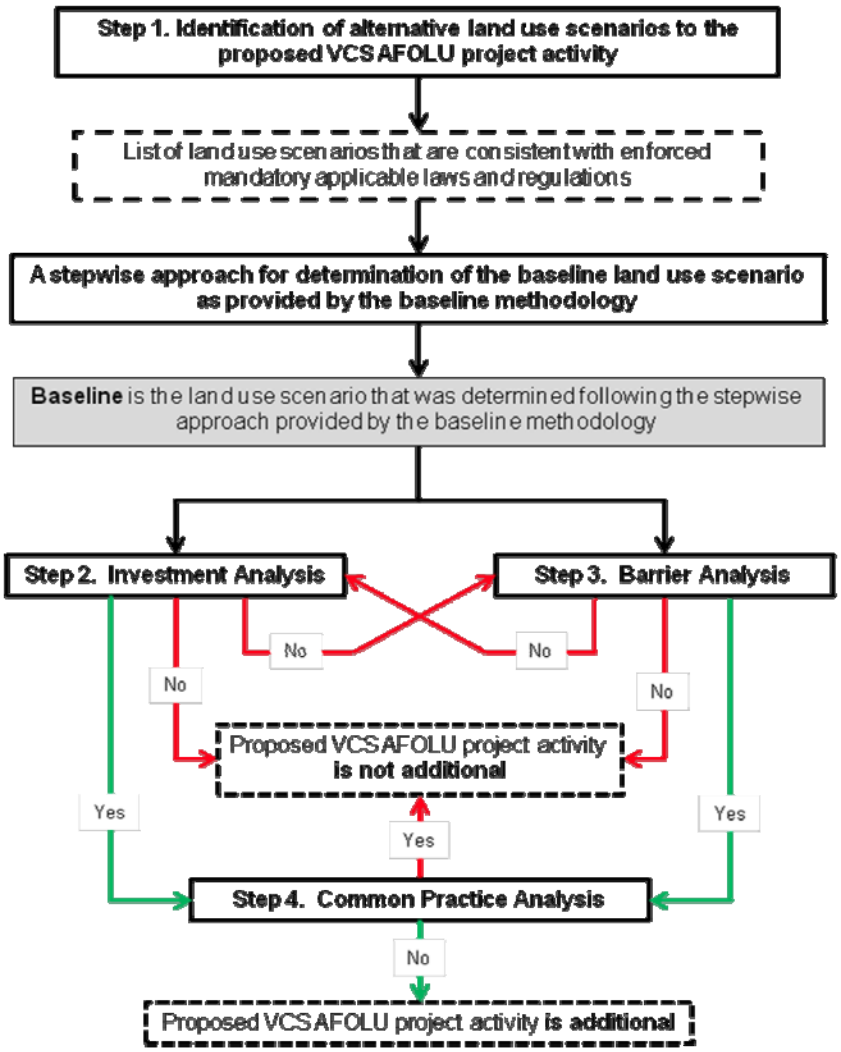


Figure 12. Step-wise approach to determine and demonstrate project additionality.

Step 0: Preliminary Screening Based on Starting Date

The project starting date is 2008; thus, it meets the criteria for VCS that projects must start after 2002.

Step 1: Identification of Alternative Land Use Scenarios

Sub-step 1a: Identify of Alternative Land Use Scenarios

Six potential land use scenarios were identified in addition to the proposed project activity and are listed below:

1. **Conversion to palm oil estates:** The project lands are zoned on provincial and district spatial plans for conversion and the acquisition process for obtaining four oil palm estate licenses has begun for the project site.
2. **Conversion to pulp plantations:** Indonesia's two largest pulp and paper companies, APP and APRIL over the last several years have been expanding their holdings into Kalimantan. Large, industrial pulp plantations are consistent with the provincial government's strategy to provide sustained tax and employment benefits.

3. **Conversion to agriculture:** Project site is deforested and industrial scale planting of crops takes place (e.g. rice, pineapple, aloe vera, etc.).
4. **Status Quo:** Project site remains zoned as production forest with continued illegal logging taking place.
5. **Protection in the absence of carbon financing:** The project site is added into Tanjung Puting NP or gains protection under a different status.
6. **Conservation/protection with carbon financing:** project site is conserved as intact peat swamp forest with funding from carbon financing. Illegal logging no longer significant.

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

The first criteria in the step-wise test of additionality is to examine whether each alternative is consistent with the enforced applicable laws and regulations at the appropriate levels of government.

Alternative 1 above is currently not consistent with the legislated MoF National Spatial Plan that shows the project site as "Production Forest", which cannot be converted to agricultural use without the Ministry of Forestry's approval and release. However, throughout Indonesia, the vast majority of conversions have been authorized at the local and provincial levels and the 2006 provincial and district land-use plans allocate the project site for conversion (Figure 13). Both plans are currently going through a harmonization process at the national level (*process padustrasi*). There is ample evidence that the Minister has approved the conversion of "production forests" to oil palm concessions.

Additionally, the Wetlands International Peat Atlas for Indonesia suggests that the Rimba Raya area is situated on shallow peats, mostly less than two meters deep. Therefore, the Presidential Decree classifying peat swamps over three meters deep as protection forest has not and would not be in effect[15]. In summary, alternatives 1 – 3 would be in compliance with applicable laws and regulations and in particular with common historical practice.

[15] Presidential Decree 32/1990

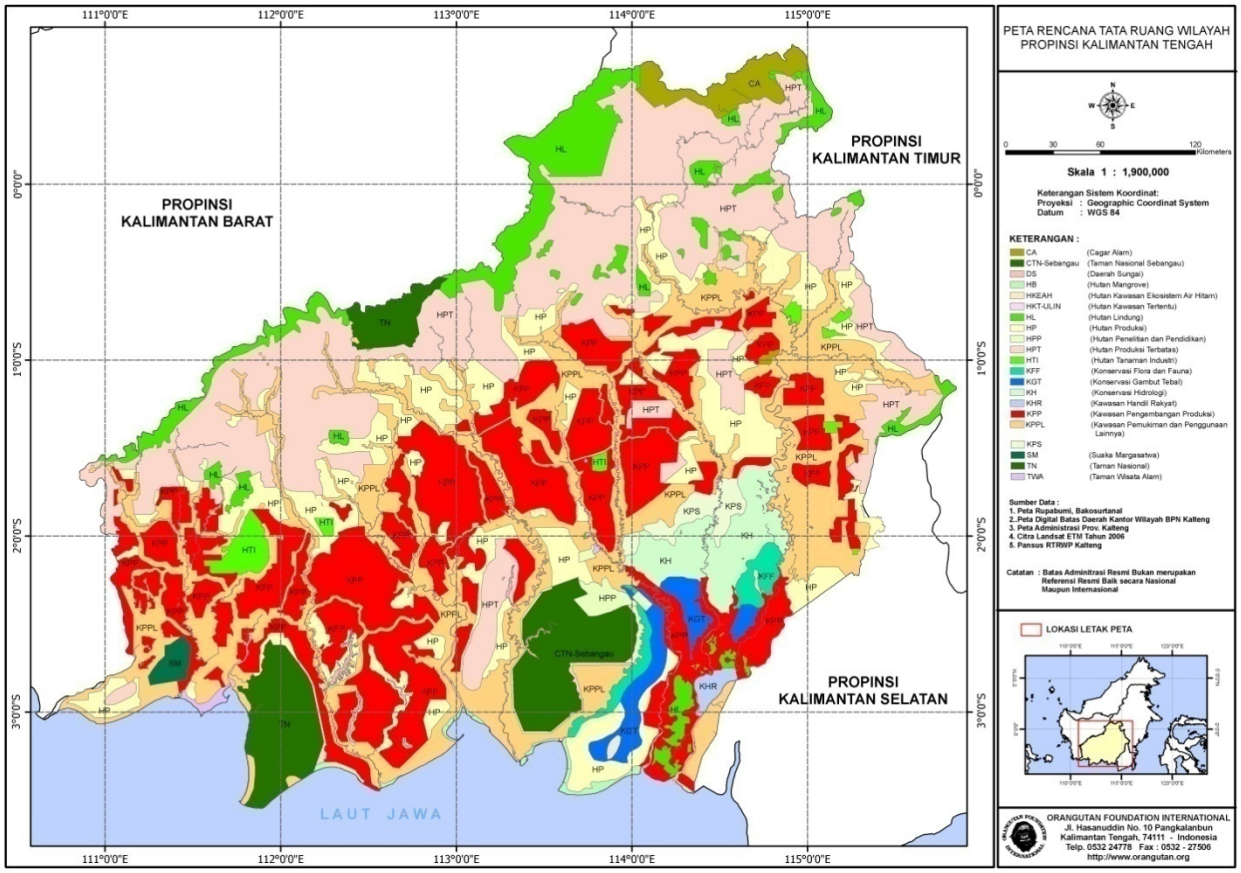


Figure 13. 2006 Provincial Land-Use Plan showing all of Rimba Raya as gazetted for conversion (red).

Alternative scenario 4 is in full compliance with current laws and regulations, the status quo being that at the national level, the area could continue to be logged and the status quo at the local and provincial level that the area could be logged initially, prior to clearing for palm oil.

Alternatives 5 and 6 would require that the current spatial plans and the draft plans be changed from production forestry to a conservation status. Indonesia has a poor record of being able to defend its National Parks. Tanjung Puting, in particular, has suffered at the lands of commercial scale illegal logging and the deforestation agent has encroached into the park boundaries by illegally expanding their concessions beyond their borders.

Another method consistent with the laws and regulations for conserving the forest in the project site is to apply for a Restoration Ecosystem Concession (IUPHHK) to the Minister of Forestry. This type of concession is designed for production forest lands that have been repeatedly logged, but still possess significant conservation values. In fact, the project proponent has solicited the MoF for such a concession[16].

Sub-step 1c: Selection of baseline scenario

From the assessment above, **all six scenarios are feasible** under the relevant Indonesian laws and regulations.

[16] Proposal available upon request to Infinite Earth

STEP 2: Investment Analysis

Conducted barriers analysis instead, as allowed in the "*VCS-Tool-VT0001_Tool-for-Demonstration-and-Assessment-of-Additionality-in-AFOLU-Project-Acitivities".*

"Barrier analysis maybe performed instead of or as an extension of investment analysis" (pg 6).

STEP 3: Barrier analysis

Barriers can take various forms such as institutional, technological, ecological, cultural, and sociological. This section identifies if barriers are in place and what type of barrier it is for each alternative scenario.

Sub-step 3a. Identify barriers that would prevent the implementation of the type of proposed project activity

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

For superior clarity, sub-steps 3a & 3b are best reviewed jointly. Both criteria have been applied to each barrier identified.

Barriers to Alternative Scenario #1 (conversion to palm oil plantations)

There are no barriers to alternative scenario #1. Rather, there are several incentives for this land use scenario, all of which would prevent the implementation of the proposed project activities, summarized below:

- Indonesia is the world's largest producer of palm oil, with Malaysia close behind it. Together they account for 87 percent of global production[17]. Indonesia's palm oil production has been steadily growing, primarily for export. In 2006, of the estimated 14-16 million tons produced, some 11 million tons were exported, according to the Indonesian Palm Oil Producers Association (Gapki)[18]. An estimated 19.5 million tons of palm oil are expected to be produced in Indonesia in 2009[19].
- Indonesia currently has an estimated 5.5 million hectares of palm oil plantations, and the area under cultivation through the development of an additional 6.1 million hectares in Kalimantan, Papua and other provinces[20].The province of Central Kalimantan has the third most extensive area of land available for oil palm in Indonesia (Table 9).

[17] US Department of Agriculture Commodity Intelligence Report, 31 December 2007.
[18] Indonesia's palm oil production expected to rise in 2006. Xinhua, 06 March, 2006
[19] The Jakarta Post, Feb. 13, 2009. Government to allow peatland plantations.
[20] Guerin, B. A who's who of Indonesian biofuel. Asian Times, 22 May 2007.

Table 9. Extent of area (ha) suitable for the development of oil palm (source: Hasibuan 2006)

Province	Area (ha)
Nanggroe Aceh Darussalam	384,871
North Sumatera	37,000
West Sumatera	355,814
Riau	2,563,156
Jambi	1,818,118
South Sumatera	1,483,959
Bangka Belitung	593,038
Bengkulu	208,794
Lampung	336,872
Banten	63,742
West Jawa	224,708
West Kalimantan	1,681,186
Central Kalimantan	3,610,819
South Kalimantan	1,162,959
East Kalimantan	4,700,333
Central Sulawesi	256,238
South Sulawesi	192,370
Southeast Sulawesi	10,264
Papua	6,331,128
TOTAL	26,015,372

- While about three quarters of Indonesia's production comes from Sumatra, the provinces with the greatest potential for continued growth are Kalimantan and Irian Jaya, due to the relative availability of land for conversion to plantations. According to the Indonesian Chamber of Commerce, in 2006 East and Central Kalimantan together accounted for over 30 percent of the remaining land area in Indonesia suitable for conversion to oil palm plantations. This has resulted in an increasing area within Central Kalimantan that supports industrial oil palm, going from no formal plantations in 1967 to 200-300,000 ha of planted area in 2002. The Indonesian Chamber of Commerce reports that palm oil area in Central Kalimantan grew from 240,000 hectares in 2003 to nearly 270,000 hectares in 2005.
- In July 2008, the Central Kalimantan government reported 2,847,720 ha of proposed oil palm plantations in the region, by 186 companies, with investments on the order of US$25M planned[21]
- Specifically, regarding the Rimba Raya site, the only technical/financial barrier that could exist is the lack of a CPO processing facility nearby. However, a processing plant is now under construction at the district capital of Kuala Pembuang less than 20 km away.

Barriers to Alternative Scenario #2 (conversion to pulp/paper plantation)

The barriers analysis applied to oil palm is also relevant for establishing a pulp and paper tree plantation. As already mentioned, over the last several years, there has been a rapid expansion of the holdings of the two largest Indonesian pulp and paper companies. APP purchased PT Finnantara and PT Surya Hutani Jaya II, a

[21] http://www.kalteng.go.id/INDO/Kebun_investor.htm

180,000ha pulp tree plantation in East Kalimantan. APRIL acquired PT Adindo, a 219,000 ha plantation in East Kalimantan. The most common species planted on peat swamps for production of pulp is *Acacia crassicarpa*.

One barrier that a pulp company would have to overcome is with transporting the logs or chips to a pulp mill, the closest being located in Banjarmasin in South Kalimantan, 300 km away. Currently, there isn't a road system that connects the Rimba Raya area with the main road to Banjarmasin. However, one possible solution would be to use barges towed up the Seruyan River with the logs being chipped at the log pond. From the log pond, the chips could be shipped by barge to the pulp mill.

There are institutional barriers to this scenario. The northern section of Rimba Raya already has an active oil palm estate and the remaining area has permits that recognize their preliminary borders. Therefore, there would be an institutional barrier in place, given the provisional commitment from local government to the oil palm developers. Additionally, pulp plantations haven't been established in this area and are not the prevailing practice.

This barrier would have prevented the proposed project activities.

Barriers to Alternative Scenario #3 (conversion to agriculture that is not palm oil):
There appear to be barriers due to local ecological conditions: The project area is not suitable for agricultural development other than palm oil due to its presence on peat. The failed Mega Rice Project was halted in the late 1990s in Central Kalimantan after it was drained due to the realization that areas of deep peat were unsuitable for agriculture other than palm oil.

Barriers due to prevailing practice: growing crops other than palm oil is not a common land use within the project region.

Barriers to Alternative Scenario #4 (Status Quo)
There appear to be institutional barriers: Though the project land was zoned as production forest in the past, in 2006 individual permits were issued by the district governments to develop at least 4 palm oil concessions in the project area. One concession is already active. Central Kalimantan's 2006 Spatial Plan (RTRWP), currently undergoing approval by the Indonesian government, shows the entire carbon accounting boundary area zoned for agricultural development, thereby supporting the notion that the project region was re-designated from production forest to development land, likely because much of the valuable timber in the region has already been extracted. Therefore, continued classification as production forest faces institutional barriers because local and provincial government plans seek to convert the forest.

This barrier would have prevented the proposed project activities.

Barriers to Alternative Scenario #5 (conservation in the absence of carbon financing):
There appear to be institutional barriers: the conservation forest scenario faces institutional barriers because conserving this area would go against the ground swell of government support for increased oil palm tax and employment benefits. Additionally, given Indonesia's government debt and budget restrictions, allocating additional funds to protect this area and without the support of provincial authorities would be exceptionally difficult.

Barriers to Alternative Scenario #6 (proposed project activity):

- Investment barriers: There is currently no formal national or international capital market for this type of activity. A key intent of the project is to demonstrate the viability of harnessing carbon finance for the purpose of strengthening the case for conservation.

- Institutional barriers: The project activity faces no institutional barriers given that Indonesia has taken a leadership position in the development of a regulatory framework to support REDD.

- Barriers due to prevailing practice: No project activity of this type is currently operational in the region.

- Technological barriers: Fire is the most significant threat to the project area. The project proponent's partner, OFI, has had a long history in providing for forest conservation protection inside Tanjung Puting National Park around Camp Leakey including the construction and staffing of 20 permanent guard posts.

Sub-step 3b. Elimination of land use scenarios that are prevented by the identified barriers

The land use scenarios identified in Sub-step 1b that are prevented by at least one of the barriers listed in Sub-step 2a include:

Scenario #2: Conversion to pulp plantations
Scenario #3: Conversion to agriculture
Scenario #4: Status Quo
Scenario #5: Conservation in the absence of carbon financing
Scenario #6: Conservation with carbon financing (proposed project activity)

Thus the only remaining plausible land use scenario is: **Scenario #1: Conversion to oil palm plantations**

Sub-step 3c. Determination of baseline scenario (if allowed by the barrier analysis)

The decision tree under Sub-step 2c in the combined tool was applied:

- Is forest protection without being registered as a voluntary project activity included in the list of land use scenarios that are not prevented by any barrier? Decision: **No**

- If no, then: Does the list contain only one land use scenario? Decision: **YES**

- If yes, then **the remaining land-use (Conversion to Palm Oil) is the baseline scenario**.

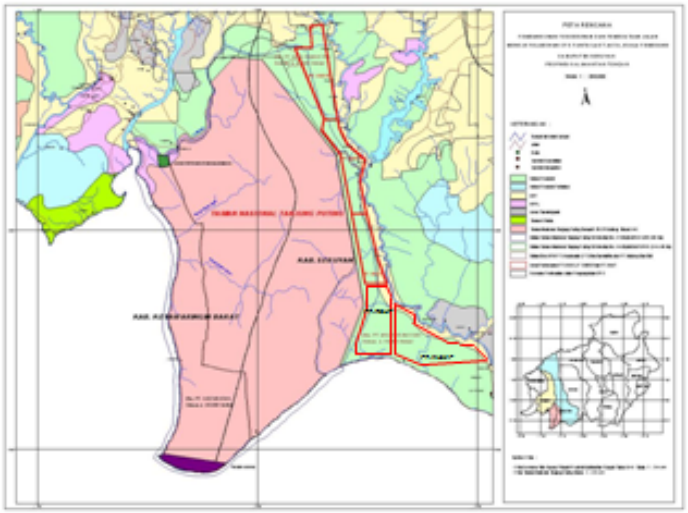
STEP 4: Common practice analysis

Conservation activities such as Rimba Raya are not common in the region. One other conservation project, the Mawas Conservation Project, is carrying out conservation activities in south-eastern Central Kalimantan, but this project is not fully operational due to implementation challenges. Although the investment analysis was not necessary to determine the most likely baseline scenario, additional evidence demonstrating that the project lands are under threat of conversion to plantations is summarized below. It should be noted that government documents are not publically available. While copies of some permits were obtained, it wasn't possible to get copies of all outstanding permits in the Rimba Raya area.

Supporting Documentation

1. During a public hearing on TPNP and provincial government plans, the head of the Central Kalimantan Forestry Office in a presentation made in December of 2006, presented a map showing the oil palm estate borders (Figure 14).

TAMAN NASIONAL TANJUNG PUTING
Dan Rencana Pembangunan Perkebunan/Pembuatan Jalan Menuju Pelabuhan CPO Pantai Laut Jawa Kuala Pembuang Kabupaten Seruyan



Oleh :
Kepala Dinas Kehutanan Provinsi Kalimantan Tengah

Figure 14. Map of TPNP (in pink) and planned oil palm estates (red outline) presented by Provincial Forestry Office Head.

2. Additional Supporting Government Documents **(Annex 4)**
    a. In 2004 The SurayanBupati has issued location permits for all 4 oil estates with copies being obtained for PT EkaSawit
    b. On January 18, 2005 The Central Kalimantan Governor has sent a letter (522.2/073/EK) as a follow up to (525 not in our possession) to the Minister of Forestry requesting that the planned four other estates in the Rimba Raya area be changed from production forest to conversion status
    c. On May 13, 2005 the Minister in response to letter No. 525 (July 2004) from the Governor that he is in basic agreement with the conversion but request the Governor to swap forest areas that were formally classified for conversion to production
    d. In 2006 the Minister of Forestry has set a precedent of issuing decrees allowing the conversion of production forest and specifically issued a decree allowing the conversion of production forest in the buffer zone of TPNP for the establishment of PT Kharisma Unggu Centraultama,

3. In February 2009, the Joint Spatial Planning Team appointed to resolve the conflict between the 2006 Provincial Spatial Plan and the MoF spatial plan presented their conclusions, which included a recommendation that for Production Forest areas that already possess an '*ijin lokasi*' the status should be changed to Conversion Forest. This includes all four planned oil estates in Rimba Raya.

4. During a recent field trip to Rimba Raya, a newly dug canal and road was observed connecting the PT Kharisma oil palm estate with the Seruyan River (Figure 15). Installing these canals is common practice in oil palm estates to provide access to the estate, and allow for drainage of the peat swamp, and undoubtedly more will be dug further south.

Figure 15. Photograph of recently dug canal and road from Seruyan River to PT Kharisma oil palm estate (coordinates: 2.68 degrees South, 112.204 degrees East)

3. Monitoring

Section 14. of the methodology

The methodology outlines the methods for monitoring land use change, forest degradation and carbon pools and forms the basis for implementing the monitoring plan. It facilitates the monitoring of project activities, and serves as reference for monitoring, reporting, and verification required for evaluating project performance, and to support the accurate determination of carbon offsets by project activities.

The methodology was designed so that all necessary field measurements including measurements of baseline carbon stocks can be performed up front – prior to project implementation, if desired, thus limiting monitoring activities over the crediting period to monitoring activity data only (area changes).

3.1. Title and reference of the VCS methodology (which includes the monitoring requirements) applied to the project activity and explanation of methodology choices:

The VCS methodology (including monitoring requirements) employed by this project is the ***Approved VCS Methodology VM0004 Version 1.0 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, Sectoral Scope 14,***which has been validated under the VCS double-approval process.

The project activity of peat swamp forest conservation is taking place in an area that was planned for conversion to palm oil plantations. Without the project, the Carbon Accounting Area would have been deforested and drained, releasing vast amounts of CO^2 into the atmosphere. The selected methodology is currently the only VCS-approved methodology for avoided deforestation in tropical peat swamp forests and is relevant for planned conversion of peat swamps throughout Southeast Asia.

Major components of this methodology were developed by Winrock International for the Mawas Peat Swamp Conservation project, less than 150 km from Rimba Raya. Therefore, this methodology is particularly applicable to the Rimba Raya project, which meets all applicability criteria of the methodology.

3.2. Monitoring, including estimation, modeling, measurement or calculation approaches

3.2.1 Purpose of monitoring

The purpose of monitoring for carbon accounting is to ensure that estimates of GHG removals presented in the VCS Project Document are being met, and to identify and account for any unplanned reductions in project carbon stocks, increase in project emissions or possible leakage outside the project boundary. Additionally, monitoring the project implementation will enable project proponents to objectively assess project components, identify gaps and deficiencies and use this information to improve both monitoring and management. This adaptive management approach is a key feature of the Rimba Raya program.

3.2.2 Approach to monitoring

Annual monitoring activities consist of remote sensing and G.I.S. analysis, routine field patrols and directed field sampling in areas prioritized by systematic site assessments. The monitoring system takes a hierarchical approach starting with medium resolution (30-50m) satellite imagery, then high resolution satellite or aerial imagery (5-10m), and finally with ground patrols.

A key feature of the Rimba Raya monitoring plan is to employ spatial data and tools to systematically monitor land cover change, forest degradation and carbon pools in the project area and project buffer. This is combined with ground-based surveys to investigate and record information on any activities that affect project carbon stocks and peat emissions (e.g. fire, logging). Such an approach improves the efficiency and effectiveness of directed field visits, which is essential for reliably monitoring the Rimba Raya project boundary in extensive and inaccessible peat swamplands.

This type of approach to field monitoring has been employed by project partner, Orangutan Foundation International, in the project area since 2004. Rimba Raya monitoring builds on the existing field reconnaissance, forest survey and G.I.S. team training, protocols and monitoring systems already in place for many years.

3.2.3 Types of data and information to be reported

Section 15b of the methodology

As part of monitoring forest protection activities, any increases in GHG emissions that occur within the project boundary after the start of the project must be recorded and deducted from the ex ante estimate of baseline emissions.

The following information will be recorded in the project database and reported at the time of verification as per the methodology:

1. Area where natural or anthropogenic disturbances (including fire, illegal logging and other land use change) occurred within the project boundary by date, location, biomass lost or affected, and the preventative or curative measures, if any implemented.

2. Number and location of logging gaps by date, location, biomass lost or affected, and the preventative or curative measures, if any implemented.

3. Area and depth of peat burned within the project area by date, location, estimated peat emissions, and the preventative or curative measures, if any implemented.

4. Area of peat, if any, that was drained within the project boundary by date, location, estimated peat emissions, and the preventative or curative measures, if any implemented.

5. Information on forest protection practices

3.2.4 Origin of the data

Monitoring data will be derived from multiple direct sources including field measurements recorded using GPS, hardcopy field data sheets and electronic data recording instruments as well as spatial analysis tools including remote sensing, G.I.S., statistics and spreadsheet software. Other scientific research, academic literature and expert opinion will be used to supplement field measurement and analysis where appropriate and as recommended by the methodology. Such indirect sources are necessary for developing and refining reliable assessment tools for carbon accounting in peat swamps where the science is still new and growing. It is hoped that publication of Rimba Raya monitoring and research can help build this important regional database for similar REDD peat conservation projects.

3.2.5 Monitoring, including estimation, modelling, measurement or calculation approaches

Monitoring will target landcover change and activities potentially affecting carbon stocks and GHG emissions in defined strata of the project boundary, project management zone (including 3km buffer) and leakage areas. Estimation, modeling, measurement and calculation approaches will follow requirements of the methodology. These approaches are briefly described below and detailed in section 3.4.

Routine monitoring patrols at guard posts, major waterways and project access points will be ongoing monthly as part of forest protection activities throughout the project management zone. Patrol activities will be compiled in quarterly reports.

Landcover change monitoring using readily available satellite imagery such as Landsat and ALOS will be monitored quarterly to ensure complete temporal and spatial coverage of the project management zone. In addition, high spatial resolution imagery such as Quickbird, Ikonos or LIDAR satellite data or aerial surveys will be collected annually for the carbon accounting area to record forest condition and identify forest gaps. Detected change will be recorded and investigated using image analysis techniques followed by survey patrols. These patrols will be deployed as needed depending on the frequency and scale of deforestation and will be used to record any new logging, canal building or other deforestation activity as described in the methodology. It is expected that such activities will be limited in the project area and that two to three annual patrols will be sufficient to report on activities and record damage as outlined in section 3.4. Land change monitoring reports will be compiled annually.

Fire monitoring will be conducted over a range of frequencies depending on the season and fire condition and will rely on the Fire Information for Resource Management System (FIRMS) delivery of MODIS satellite maps of hotspot and fire locations. After the rainy season begins, usually December, fire map data will be monitored monthly. As the dry season approaches, usually July, fire map data will be monitored weekly. And at the height of fire season, usually August-October, fire data will be monitored daily. Satellite monitoring will be implemented as part of the comprehensive fire plan described in section 3.4 and will be used to direct and deploy fire fighting and survey teams on an as-needed basis. Fire monitoring and response activities will be reported annually at the end of fire season surveys.

Biomass plots surveyed at the project start were established on permanent transects and recorded to facilitate regular monitoring over the life of the project. Such monitoring is additional to methodology requirements but can provide detailed accounts of forest condition over time. Provided that all required land change monitoring necessary for carbon accounting can be accomplished, a random sample of biomass plots (two plots per transect, 16 total), will be resurveyed every four to five years. By surveying in years 1, 5 and 10, three surveys will have been completed by the ten-year baseline reassessment required by VCS, thus allowing trends in biomass change to be detected.

The project boundary and stratification will be monitored for any changes to land cover that reduce project carbon stocks or increase GHG emissions. Since the project boundary is not a functionally discrete hydrological unit, a 3km buffer zone surrounding the project boundary will be monitored for new drainage activities that could potentially impact peat emissions inside the project boundary. Stratification of the project area will be monitored and periodically updated to incorporate any land change into revised land cover classification maps based on new data.

Leakage or activity displacement outside the project boundary will be monitored and accounted in order to adjust net GHG emissions avoided by the project. Monitoring will include existing or new concessions operated by PT Best (the agent of baseline deforestation) as well as any unpermitted land conversion by PT Best. Leakage monitoring will be conducted in accordance with the methodology described in section 3.4.

3.2.6 Monitoring components, times and periods, considering the needs of intended users

There are eight major components of monitoring: three that are focused on project conditions and forest protection (Table 10) and five that are focused on annual land change assessment for carbon accounting (Table 11).

Table 10. Monitoring Components: Project Conditions and Forest Protection

Monitoring Component (pg ref in Meth)	Activity and Years	Times and periods	Detection frequency	Remote sensing data, resolution, coverage and years	Field survey frequency	Reporting frequency
Boundary (p.67)	Mark in field [Yr1 temp stakes on boundary with palm oil, Yr2& Yr3 permanent stakes in other high risk areas – replace as needed]	Year-end	Non-specific	n/a	1 field survey annually	Annually
	Patrol Yr1-Yr30		Annually	ALOS 50m or Landsat 30m + high res aerial or satellite imagery (1-5m) every 2 years starting Yr2		
Stratification (p. 68)	Land cover classification (Yr1 develop model, Yr2-3 refine model, Yr 4-30 apply standard model)	Year-end	Annually	ALOS 50m or Landsat 30m + field data + sample high res aerial or satellite imagery (1-5m) for accuracy assessment in Yr 1,3,5 etc. Full coverage high res aerial or satellite imagery (1-5m) + field data in Yr 2,4,6 etc.	1 field survey annually	Annually
Forest Protection (p. 68)	Routine patrols and as-needed intervention (expanding coverage and intensity of intervention Yr-1 to Yr-3 in conjunction with community and stakeholder involvement)	Year-round	Quarterly	ALOS 50m or Landsat 30m + SPOT and high resolution imagery collected for boundary and strata monitoring	1 patrol quarterly and as-needed	Quarterly

Table 11. Monitoring Components: Land Change Assessment for Carbon Accounting

Monitoring Component (page reference in Methodology)	Activity and Years	Times and periods	Detection frequency	Remote sensing data, resolution, coverage and years	Field survey frequency	Reporting frequency
Land change (p. 70, 83)	Detection and area calculation of land change caused by agents other than logging or fire (e.g. mechanical clearing)	Year-round	Semi-annually	Landsat 30m for detection plus targeted high resolution imagery (aerial or satellite with 1-5m resolution) as needed to support analysis and field surveys	2-3 field surveys annually	Annually
Logging (p. 71)	Detection and area calculation of deforestation caused by logging	Year-round with increased activity during wet season	Semi-annually	high resolution imagery (aerial or satellite with 1-5m resolution) as needed for logging gap analysis	2-3 field surveys annually	Annually
	Detection and survey of transport canal-building associated with logging			high resolution imagery (aerial or satellite with 1-5m resolution) and ground data		
Fire (p.78)	Detection of fire ignitions, calculation of burn areas (deforestation associated with fire)	Year-round with increased activity during dry season	Monthly, weekly, daily	MODIS imagery (1 km thermal band detects fires as small as 100m2 and imagery is collected and posted daily)	2-3 field surveys annually	Annually
Biomass plot surveys (not required)	Survey of above ground biomass originally conducted for the baseline carbon assessment	End of year	None	linked to high resolution aerial imagery (1-5m)	1 field survey every five years	10-year baseline reports
Leakage (p.40)	new permit activity	Year-round(first five years of project 2009-2014)	Quarterly	n/a	n/a	Annually
	Spatial analysis of new palm oil in areas of possible leakage	End of year (first five years of project 2009-2014)	Annually	Landsat 30m for palm oil boundary interpretation and delineation	none	Annually

3.2.7 Monitoring roles and responsibilities

Monitoring will be carried out by RRC and OFI professional field and GIS teams under the direction of the project coordinator. Monitoring systems have been in place for the project management area since 2005 and have been and will continue to be improved by the project since 2008. Guard posts are staffed 24-hours with two full-time staff that carry out routine observations, nearby patrols and daily reporting via radio to the OFI office. The office operations manager records daily reports into a permanent log book. The GIS team led by a GIS manager collects remotely sensed imagery and conducts monitoring analyses in the office. These analyses are provided to the field manager who uses this information to plan and schedule field surveys. The field manager prepares transportation and logistics and handles field budgets. Field team leaders direct staff in the field for conducting surveys, recording data and delivering data back to the GIS team who conducts data entry. Fire monitoring is similarly implemented with a specialized fire team manager and trained fire team. Field reports are written by field team leaders and provided to the project coordinator, as are GIS data and maps. The project coordinator uses this information to compile quarterly and annual reports and conduct or supervise the carbon accounting that must be reassessed every year prior to verification. The project coordinator also ensures the QA/QC plan is followed and is responsible for updating SOPs and coordinating regular team training as well as training of new personnel.

3.2.8 Managing data quality, storage and access

Managing data quality is key to conducting successful monitoring and will be accomplished by implementing a series of protocols and standard operating procedures, conducting annual training for field staff, implementing a QA/QC plan and assigning senior personnel to supervise key phases in data handling.

Field survey protocols are described in the Carbon Stock Assessment SOP (Annex 5a). Patrol staff currently operates under the SOP developed by OFI for forest protection activities (Annex 5b). The QA/QC plan is included in Annex 6. These plans will be employed by project staff, updated annually, and included in annual monitoring reports.

In accordance with the Voluntary Carbon Standard 2007.1 section 5.13, the project proponent is committed to storing all project data in a secure and retrievable manner for at least two years after the end of the project crediting period. Project data will be stored and regularly maintained on redundant external hard drives at onsite (Pangkalan Bun, Central Kalimantan) and offsite (Jakarta) locations and secured with backup software using standard protocols. Data storage locations are listed below. Any changes in these locations will be listed in annual verification reports. Project data will be managed by the Rimba Raya Conservation (RRC) project coordinator in conjunction with the GIS manager to ensure security, accessibility and long-term storage. In order to facilitate project management and long-term accounting, all primary data outputs supporting annual verification including the spatial database, will be stored and maintained for each 10-year crediting period.

Onsite data storage
Jl. Hasanudin, No. 10 Blk
Pangakalan Bun Kalimantan Tengah, 74111
Phone: 0532 24778
Fax: 0532 27506

Offsite data storage:
Mayapada Tower, 11th Floor
Jl. Jenderal Sudirman Kav.28,
Jakarta Selatan, 12920
Tel: +62-21-5289-7446
Fax: +62-21-5289-7399

3.3. Data and parameters monitored

Methodological pathways for monitoring (Figure 16) are taken from the conceptual diagram in the methodology p. 87. Specific data collected for monitoring ex post GHG emissions are summarized in Table 12. These data/parameter tables expand on those in the methodology to include value used, assumptions and decisions, uncertainty estimate and deviation information. There were no deviations in monitoring methods pathways.

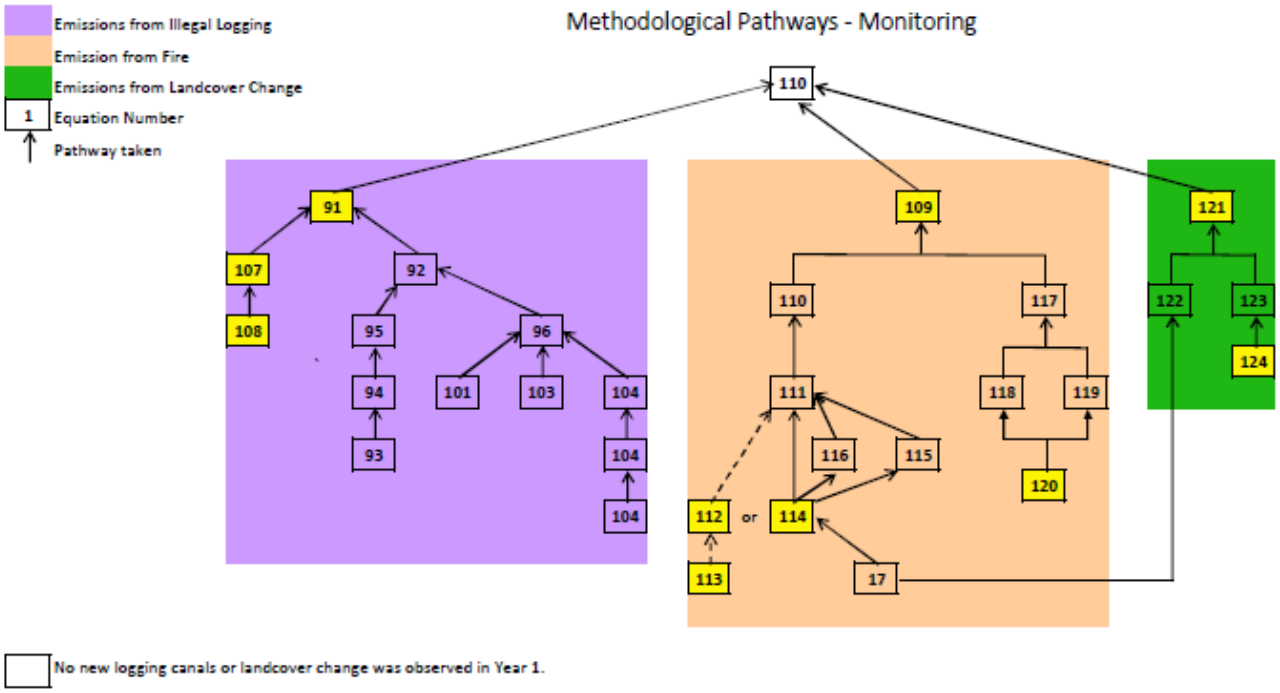


Figure 16. Methodological pathways used to calculate ex post net actual GHG emissions avoided. Pathways included in annual monitoring are shown as solid line arrows. Equations that include at least one parameter for which uncertainty estimation is required are shown in yellow boxes. Note that all pathways are implemented only as required each year. For example, equations 107 and 108, logging emissions associated with peat drainage, were not used in year 1 because there were no new logging canals.

Table 12. Data collected and archived for *expost* net actual GHG emissions avoided

Data/parameter 1:	*N gapsP, it*
Data unit:	dimensionless
Used in equations:	91
Description:	number of logging gaps detected in stratum *i*, time t in the project area
Source of data and reference:	Field data – see field survey report, Yappi 2010
Measurement procedures: (if any)	
Value used:	40 (year 1)
Comment:	
Assumptions and Decisions:	Logging gaps were found by directed searches to areas of known logging activity based on community surveys.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 2:	*L* log , tr, tk
Data unit:	m
Used in equations:	93,97
Description:	length of log extracted from timber tree tr in stratum i, gap k, measured as the distance from stump to base of crown, less the length of any pieces of bole left on site
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 “An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project.”
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 3:	*D bottom, tr, ik*
Data unit:	Cm
Used in equations:	93
Description:	Diameter at the stump end of log extracted from timber tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 “An initial set of ground measurements in logging gaps

	shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 4:	*D top, tr, ik*
Data unit:	Cm
Used in equations:	93, 97
Description:	diameter at the crown end of log extracted from timber tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 5:	ϕ_i
Data unit:	t m-3
Used in equations:	94
Description:	Wood density[52] of extracted log in stratum *i*
Source of data and reference:	Literature Value: Reyes, Brown, Chapman and Lugo (1992) mean wood density for tropical Asia represented by 428 species, SE = 0.007
Measurement procedures: (if any)	
Value used:	0.57 (SD = 0.145)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	90%CI/mean* 100 = 2.03%
Deviation from Methodology:	None

Data/parameter 6:	*CF*
Data unit:	dimensionless
Used in equations:	100
Description:	Carbon fraction of dry matter (extracted log)
Source of data and reference:	IPCC default = 0.50 used in Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	n/a
Value used:	0.50

Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 7:	$D_{s,tr,ik}$
Data unit:	Cm
Used in equations:	97
Description:	Diameter of the stump of the logged timber tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 8:	$H_{tr,ik}$
Data unit:	M
Used in equations:	98
Description:	Height of tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 9:	$D_{pce\text{-}b,tr,ik}$
Data unit:	Cm
Used in equations:	100
Description:	Diameter of bottom end of piece *pce* left from

	timber tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 10:	$L_{pce,tr,ik}$
Data unit:	m
Used in equations:	100
Description:	Length of piece *pce* left from timber tree *tr* in stratum *i*, gap *k*
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 11:	$D_{pce\text{-}t,tr,ik}$
Data unit:	Cm
Used in equations:	100
Description:	Diameter of top end of piece *pce* left from timber tree *tr* in stratum *i*, gap *k*: cm
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	See logging gap spreadsheet (Winrock 2008)
Comment:	
Assumptions and Decisions:	Mawas logging gap data is applicable to Rimba Raya and is used as allowed by the methodology p. 71 "An initial set of ground measurements in logging gaps shall be completed at the beginning of the project or over the life of the project."
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 12:	$D_{logging\ drain,it}$
Data unit:	Cm
Used in equations:	108
Description:	Average depth of peat drainage or average depth to water table in drained area of stratum *i*, time *t* during the dry season
Source of data and reference:	Field measurements
Measurement procedures: (if any)	
Value used:	No new logging canals detected (year 1)
Comment:	
Assumptions and Decisions:	
Uncertainty estimate:	Required (n/a year 1)
Deviation from Methodology:	None

Data/parameter 13:	$A_{logging\ peatimpact,it}$
Data unit:	Ha
Used in equations:	107
Description:	Area of drainage impact in stratum *i*, time *t*
Source of data and reference:	Calculated in GIS
Measurement procedures: (if any)	
Value used:	No new logging canals detected (year 1)
Comment:	
Assumptions and Decisions:	
Uncertainty estimate:	Required (n/a year 1)
Deviation from Methodology:	None

Data/parameter 14:	CE
Data unit:	Dimensionless
Used in equations:	112
Description:	Average biomass combustion efficiency
Source of data and reference:	IPCC default =0.50
Measurement procedures: (if any)	
Value used:	0.50
Comment:	Same as baseline data/parameter 8
Assumptions and Decisions:	
Uncertainty estimate:	Required. Zero. Default value used.
Deviation from methodology:	None

Data/parameter 15:	$MC_{burned\ P,AG,it}$
Data unit:	t C ha^{-1}
Used in equations:	113
Description:	Estimated aboveground carbon stock after burning under the project case for stratum *i*, time *t*
Source of data and reference:	Field measurements
Measurement procedures: (if any)	

Value used:	n/a (not measured)
Comment:	
Assumptions and Decisions:	According to the methodology p. 81 "If no field measurements are available of carbon stocks after burning, then the CO2 emission factor for biomass burning should be conservatively estimated as the CO2 equivalent of the mean baseline aboveground carbon stock of the stratum in which fire was detected."
Uncertainty estimate:	Required (for field measurement) n/a year 1
Deviation from Methodology:	None

Data/parameter 16:	*N/Cratio*
Data unit:	Dimensionless
Used in equations:	115
Description:	Nitrogen-carbon ratio
Source of data and reference:	IPCC default=0.01
Measurement procedures: (if any)	
Value used:	0.01
Comment:	See Monitoring ABG Biomass Burn2010 worksheet
Assumptions and Decisions:	
Uncertainty estimate:	Not required
Deviation from methodology:	None

Data/parameter 17:	ER_{N20}
Data unit:	t CO_2-e (t C)$^{-1}$
Used in equations:	115
Description:	Emission ratio for N_2O
Source of data and reference:	IPCC default value=0.007
Measurement procedures: (if any)	
Value used:	0.007
Comment:	See Monitoring ABG Biomass Burn2010 worksheet
Assumptions and Decisions:	
Uncertainty estimate:	Not required
Deviation from methodology:	None

Data/parameter 18:	ER_{CH4}
Data unit:	t CO_2-e (t C)$^{-1}$
Used in equations:	116
Description:	Emission ratio for CH_4
Source of data and reference:	IPCC default value =0.012
Measurement procedures: (if any)	
Value used:	0.012
Comment:	See Monitoring ABG Biomass Burn2010 worksheet
Assumptions and Decisions:	
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 19:	GWP_{N2O}
Data unit:	t CO_2-e (t N_2O)$^{-1}$
Used in equations:	115
Description:	Global Warming Potential for N_2O
Source of data and reference:	Methodology = 310 for the first commitment period
Measurement procedures: (if any)	
Value used:	310
Comment:	See Monitoring ABG Biomass Burn 2010 worksheet
Assumptions and Decisions:	
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 20:	GWP_{CH4}
Data unit:	t CO_2-e (t CH4)$^{-1}$
Used in equations:	116,119
Description:	Global Warming Potential for CH_4
Source of data and reference:	Methodology = 21 for the first commitment period
Measurement procedures: (if any)	
Value used:	21
Comment:	See Monitoring ABG Biomass Burn2010 worksheet
Assumptions and Decisions	
Uncertainty estimate:	Not required
Deviation from Methodology:	None
IE comment	

Data/parameter 21:	$A_{p,burn,it}$
Data unit:	Ha
Used in equations:	109
Description:	Area burned in stratum *i*, time *t* in the project area
Source of data and reference:	Field measurements or using high resolution digital aerial imagery
Measurement procedures: (if any)	GIS analysis of satellite imagery and ground-truth data
Value used:	array
Comment:	See Monitoring ABG Biomass Burn2010 worksheet
Assumptions and Decisions	
Uncertainty estimate:	Required. Zero. Burn areas were assessed using MODIS fire data that has been validated to be 92-98% accurate for a tropical site in Thailand (Tanpipat et al. 2009). MODIS-based burn mapping was further improved by interpreting Landsat imagery which is widely used as a calibration image in mapping burn scars and deforestation (e.g. Tung Chu 2010) and also confirmed by ground surveys.
Deviation from Methodology:	None

Data/parameter 22:	$D_{P,burn,it}$
Data unit:	Meters
Used in equations:	120

Description:	Depth of peat burned under the project scenario in stratum *i* at time *t*:
Source of data and reference:	Methodology default value
Measurement procedures: (if any)	
Any comment:	
Value used:	0.34 m
Assumptions and Decisions	
Uncertainty estimate:	Required (for field measurement). n/a Year 1 literature value used.
Deviation from Methodology:	None

Data/parameter 23:	BD_i
Data unit:	g cm-3 = t m-3
Used in equations:	120
Description:	Bulk density of peat in stratum *i*
Source of data and reference:	Default value
Measurement procedures: (if any)	
Value used:	0.14
Comment:	
Assumptions and Decisions	
Uncertainty estimate:	Not required
Deviation from methodology:	None

Data/parameter 24:	EF_{CO2}
Data unit:	g CO_2 (t peat)$^{-1}$
Used in equations:	118
Description:	CO_2 emissions from the combustion of peat
Source of data and reference:	Literature value: Muraleedharan et al. (2000) cited in Methodology p. 38
Measurement procedures: (if any)	
Value used:	185,000
Comment:	Monitoring Peat Burn 2010 worksheet
Assumptions and Decisions	
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 25:	EF_{CH4}
Data unit:	g CH_4 (t peat)$^{-1}$
Used in equations:	119
Description:	CH_4 emission from the combustion of peat
Source of data and reference:	Literature value: Muraleedharan et al. (2000) cited in Methodology p. 38
Measurement procedures: (if any)	
Value used:	5,785
Comment:	Monitoring Peat Burn 2010 worksheet
Assumptions and Decisions	
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 26:	$A_{P, LCC, it}$
Data unit:	Ha
Used in equations:	121
Description:	Area that underwent land cover change in stratum *i*, monitoring year *t*:
Source of data and reference:	High resolution digital aerial imagery or field measurements
Measurement procedures: (if any)	GIS and satellite image analysis
Value used:	
Comment:	No land cover change Year 1 (that was not accounted in logging or burning assessment)
Assumptions and Decisions	
Uncertainty estimate:	Required (n/a Year 1)
Deviation from Methodology:	None

Data/parameter 27:	$A^{LCCn}_{peatimpact,it}$
Data unit:	Ha
Used in equations:	121
Description:	Area of drainage impact due to land cover change in stratum *i*, monitoring year *t*
Source of data and reference:	Calculated in GIS
Measurement procedures: (if any)	
Value used:	
Comment:	No drainage associated with land cover change Year 1
Assumptions and Decisions	
Uncertainty estimate:	Required (n/a Year 1)
Deviation from Methodology:	None

Data/parameter 28:	D_{LCC} $_{drain,it}$
Data unit:	Cm
Used in equations:	124
Description:	Average depth of peat drainage or average depth to water table in the deforested area under the project scenario in stratum *i*, time *t*
Source of data and reference:	Field measurements or estimated from literature values if measurements not available
Measurement procedures: (if any)	
Value used:	
Comment:	No drainage associated with land cover change Year 1
Assumptions and Decisions	
Uncertainty estimate:	Required (n/a Year 1)
Deviation from Methodology:	None

3.4. Description of the monitoring plan

Major components of monitoring outlined in the methodology are described below. **For the complete monitoring plan see Annex 7.** The following monitoring steps are required by the methodology (page 4) and are part of the Rimba Raya monitoring plan:

1. The project implementation will be monitored, including the project boundary, the area inside the project boundary protected from land use change, activities that reduce carbon stocks or increase peat emissions. Since the project boundary is not a functionally discrete hydrological unit, a 3km buffer zone surrounding the project boundary will be monitored to ensure that no drainage activities have occurred within a project year that could potentially impact peat emissions inside the project boundary as per Applicability Condition K of this methodology (page 6). Both the project boundary and the 3km buffer zone shall be monitored for new drainage activities over the life of the project.

Note that the Carbon Accounting Area was moved south during project design so that the project boundary is situated at least 3km from the southern boundary of the active oil palm plantation, therefore oil palm drainage into the project buffer is not expected. Additionally, the project will extend monitoring and management to a project management zone that covers 91,215 ha including the 47,237 Carbon Accounting Area, providing a substantial additional buffer to project carbon stocks.

2. Stratification of the project area (land cover classification) is monitored periodically because new data may become available to refine the boundary delineation and/or classification of strata. Additionally, as suggested in the methodology, two different strata may become similar enough in terms of carbon to justify their merging. The ex post stratification monitoring (annual land cover mapping) is conducted to verify the applicability of the ex ante stratification, and variables that influence the strata. Annual landcover map updates are also used to facilitate cost-effective, consistent and accurate monitoring of project carbon stock changes during the crediting period.

3. Baseline net GHG emissions do not need to be monitored in this methodology (see page 5 of the methodology). The methodology prescribes validity of the baseline identified ex ante at the start of the project activity for the crediting period, thereby avoiding the need (and associated costs) for monitoring of the baseline over the crediting period. However, technical progress and an increase in data availability may occur, allowing for altered baseline estimates (see page 69 of the methodology). While baseline monitoring is not planned for this project, **if new data become available that would affect baseline calculations (e.g. refinement to stratification, site-specific peat bulk density value, etc.), adjusted baseline net GHG emissions will be presented at annual verification**.

4. The calculation of ex post actual net GHG emissions avoided is based on data obtained from monitoring project activities including remote sensing and field surveys of new logging, drainage, fire or other deforestation activities. Project data will be supplemented with regional data values from scientific literature and calculation methods will follow the project methodology with guidance from IPCC GPG-LULUCF on estimating carbon stock changes in the carbon pools and peat emissions.

5. Leakage represents the increase in GHG emissions by sources that occur outside the project boundary that are measureable and attributable to the project activity. Leakage is assumed to occur as a result of economic activity displacement (e.g. shifting pattern of oil palm conversion) and it is this displaced activity that will be monitored and accounted in order to adjust net GHG emissions avoided by the project. Market leakage represents a one-time deduction to baseline emissions and is presented in section 4.4. Displacement leakage is monitored each crediting period and results will be presented in annual monitoring reports.

6. The QA/QC plan will be implemented to verify the accuracy and consistency of field measurements, ensure the integrity of data collection, analysis, management and archival during the crediting period. The QA/QC plan will be improved and detailed in Years 2 and 3 as project monitoring systems are refined. The project coordinator will be responsible for training staff on QA/QC plan updates.

7. Non-permanence risk analysis will be conducted by both the project developer and the verifier at the time of verification in accordance with the *"**VCS_Program Update_Tool For Non-Permanence Risk Analysis And Buffer Determination_090810**"*. The non-permanence risk deduction is presented in section 4.4.

3.5. Additional description of displacement leakage monitoring and market leakage deduction

Definition of Leakage

Section 10 of the Methodology

"Leakage (*LK*) represents the increase in GHG emissions by sources which occur outside the project boundary that are measurable and attributable to the project activity. Leakage is assumed to occur as a result of the displacement of economic activities (i.e., planned land use conversion) to areas outside the project that lead to deforestation and land use change, estimated in units of t CO2-e. Thus, as a result of the project activity, the baseline activity of planned land use change may be temporarily or permanently displaced from within the project boundary to areas outside the project boundary.

"Activity shifting leakage shall be assessed for five full years beyond the date at which deforestation was projected to occur in the baseline."

Description of Leakage Monitoring

Leakage monitoring is conducted for five years beyond the date at which deforestation was projected to occur in the baseline (July 2009 - July 2014) in accordance with the methodology. Five main points outline leakage monitoring and are described below:

1. PT BEST operates plantations only in Central Kalimantan
2. All existing PT BEST concessions will be monitored for development and/or expansion
3. Any new PT BEST concession in Indonesia will be monitored
4. Unpermitted plantation expansion will be monitored within PT BEST's infrastructure
5. The area of activity shifting leakage and carbon impact will be assessed and reported at each verification

PT BEST operates plantations only in Central Kalimantan

In Rimba Raya, the agent of proposed deforestation and conversion to oil palm plantation is PT BINTANG ERA SINAR TAMA (BEST) Investment Holding. The BEST Group, established in Surabaya by the Tjajadi Family in 1982, is involved in many aspects of the edible vegetable oil business, primarily processing, transport, holding and trading palm oil but also including cultivation.[22]

The only palm oil plantations owned or operated by PT. BEST are located in Central Kalimantan, which are served by Group-owned crude palm oil (CPO) mills in Pangakalan Bun and Sampit. All other PT BEST activity is focused in several major commercial and port cities in Java and Sumatra (e.g. processing plants in Semarang, Surabaya and Medan; tank farms in Belawan and Jakarta) and in regional transport by Group-owned road-tankers and ships.

[22] This description is sourced from http://www.asiacategory.com/co11011.html with reference to the PT BEST company website http://www.best-palmoil.com and confirmed by the Indonesian Ministry of Forestry to RRC.

PT BEST oil palm concessions are limited to four districts in Central Kalimantan and total 139,424 ha on 15 parcels according to government GIS data for HGU and Izin Lokasi permits in Central Kalimantan **(Table 13 and Figure 17)**. This data augments information on permit licenses, which were also researched. Where concession name or concession location identified in permit records made a close match to the GIS data, the concession was conservatively, considered to be affiliated with PT BEST.

Table 13. PT BEST Group oil palm concessions in Indonesia

LABEL	NAME	hectares
1	PT. WANA SAWIT SUBUR LESTARI SK74 north	4,487
2	PT. WANA SAWIT SUBUR LESTARI SK74 south	8,836
3	PT. WANA SAWIT SUBUR LESTARI SK73	7,290
4	PT. WANASAWIT SUBUR LESTARI kucc north	5,708
5	PT. WANASAWIT SUBUR LESTARI kucc south	8,161
6	PT. BANGUN JAYA ALAM PERMAI south	10,824
7	PT. BANGUN JAYA ALAM PERMAI north	11,358
8	PT. BANGUN JAYA ALAM PERMAI east	2,116
9	PT. HAMPARAN MASAWIT BANGUN PERSADA north	4,638
10	PT. HAMPARAN MASAWIT BANGUN PERSADA south	6,642
11	PT. HAMPARAN MASAWIT BANGUN PERSADA east	8,135
12	PT. TUNAS AGRO SUBUR KENCANA north	8,830
13	PT. TUNAS AGRO SUBUR KENCANA south	12,641
14	PT. BERKAH ALAM FAJAR MAS	20,005
15	PT. BAHAUR ERA SAWIT TAMA	19,754
	TOTAL	**139,424**

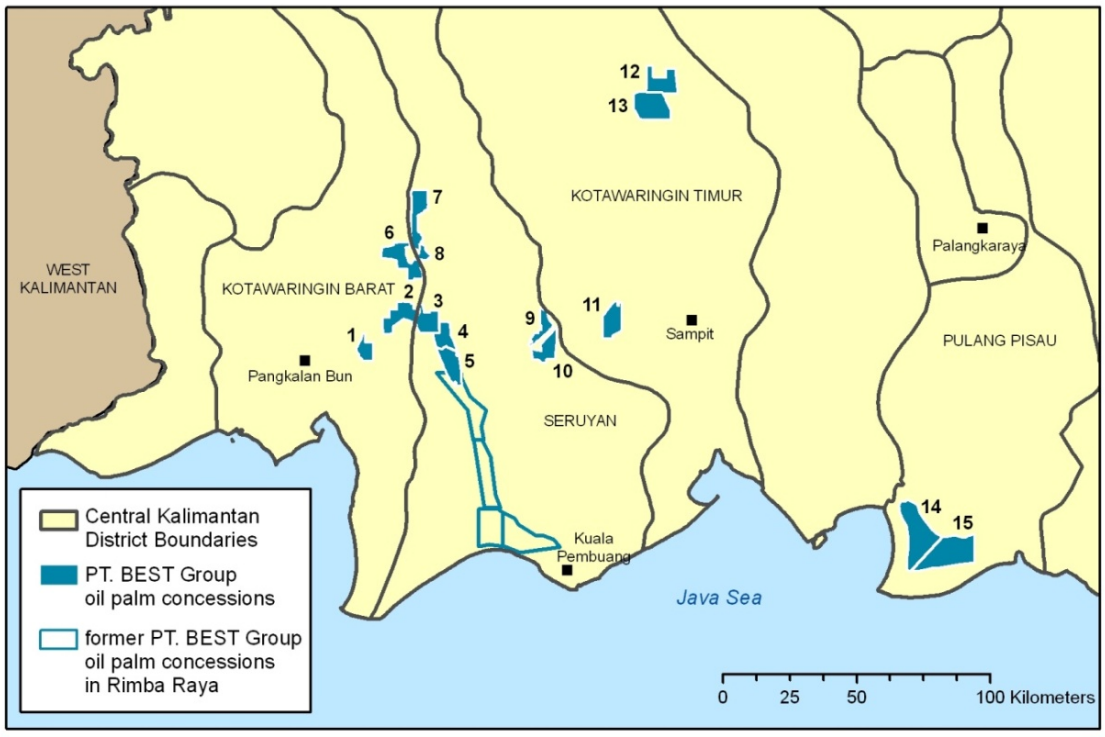


Figure 17. PT BEST Group oil palm concessions in Indonesia

Monitoring all existing PT. BEST concessions for development and/or expansion

PT BEST concessions identified in Table 13 and Figure 17 were viewed on satellite imagery (Landsat ETM+ February 2009, January 2010) to determine the extent of existing oil palm plantations, which are easily distinguished from other land cover types in Landsat data. This assessment showed that 12 of 15 concessions are already in plantation and are therefore not potential leakage sites (Figure 18).

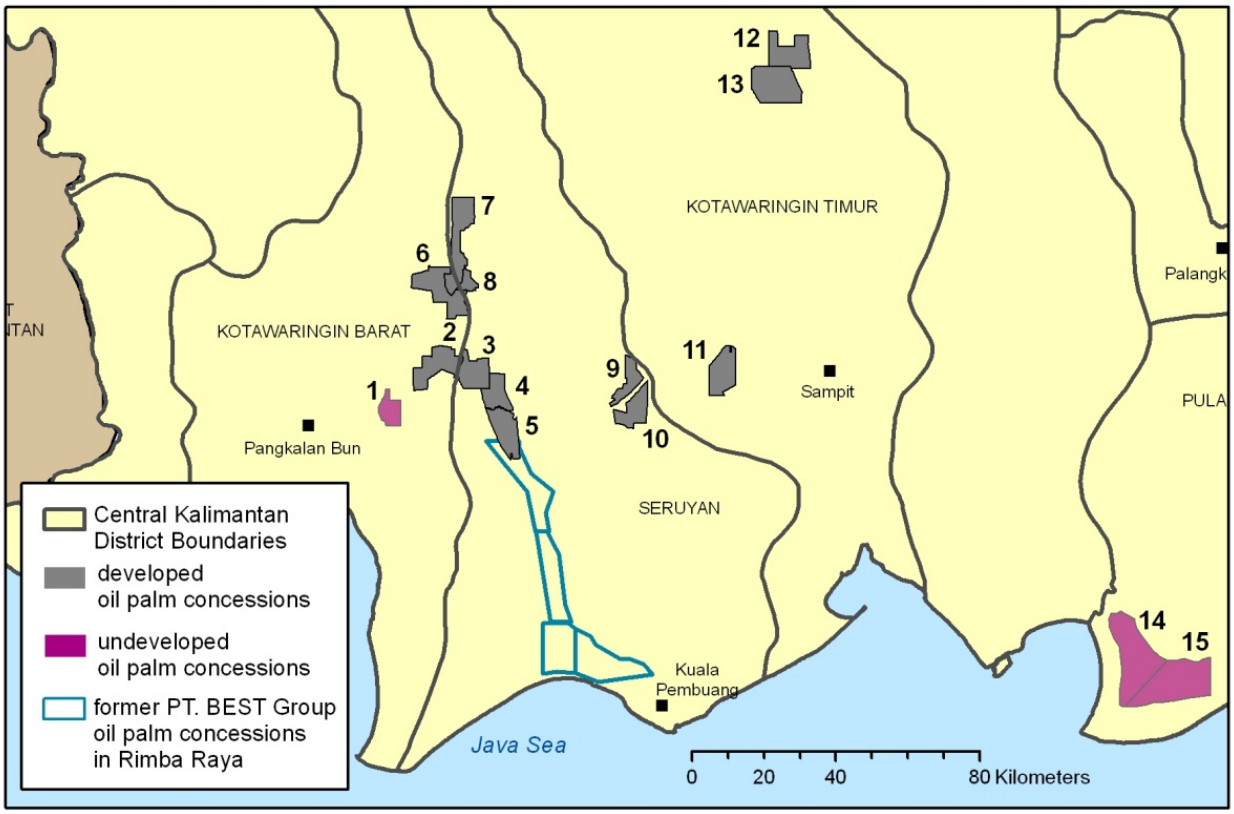


Figure 18. PT BEST Group undeveloped oil palm concessions in Indonesia

The three remaining concessions are being monitored during the 5-year period to stay informed on PT BEST activities, and any changes on these concessions will be detailed in annual monitoring reports. However, project proponents do not consider these permitted concessions to be potential leakage sites based on the following points supported by the methodology:

1. These areas have already been granted, therefore future conversion to plantation on these 3 concessions would not be considered an increase in area of government permits to PT BEST.

Section 10.2 of the Methodology (p.44)

"At each verification, documentation shall be provided covering the other lands controlled by the baseline agent where leakage could occur, including, at a minimum, their location(s), area and type of existing land use(s), and management plans. It must also be demonstrated that the total area of government permits (for deforestation activities) that have been granted to the baseline agent of deforestation has not increased due to the implementation of project activities."

2. These concessions are primarily deforested and heavily degraded, therefore conversion to palm oil would have a negligible effect on aboveground carbon.

Section 10.2 of the Methodology (p.43)

"No increases in GHG emissions caused by displacement of activities associated with the project are expected and LK = 0 if it can be demonstrated that all pre-project activities are displaced to degraded, non-forest land on mineral soils outside the project boundary that have negligible aboveground carbon stocks and that have been non-forest for at least ten years."

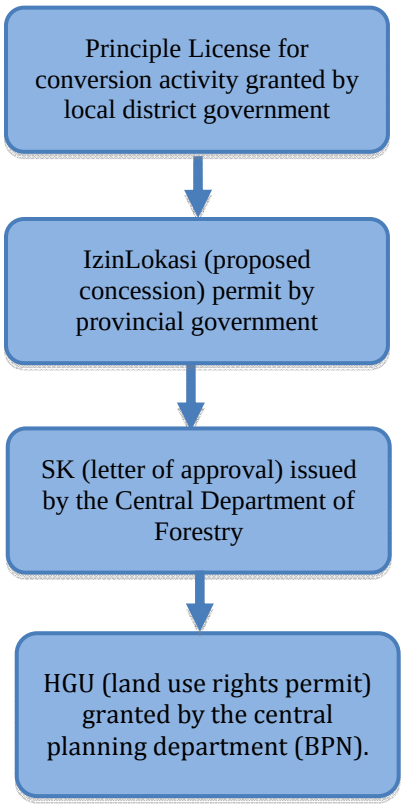
3. The land use plans for concession development were in place at the project start for these 3concessions, so future development would not constitute a change in land use designation.

Section 10.2 of the Methodology (p.43)

"In such cases, the project shall demonstrate that the management plans and/or land-use designations of other lands controlled by the baseline agent of deforestation have not materially changed as a result of the planned project (e.g., designating new lands as plantation concessions, increasing harvest rates in lands already managed for plantation products, clearing intact forests for plantation establishment);"

Any new PT. BEST concession in Indonesia will be monitored

Project proponents will also look beyond the known lands controlled by PT BEST at the beginning of the five-year monitoring period and investigate whether any new lands have come under their control. This will be accomplished by monitoring new concession licenses granted to PT BEST by the Indonesian government, through national, provincial and district land permitting offices. The following description provides background on the license process, which has informed permit monitoring.



Concession license process in Central Kalimantan

In Indonesia, district and provincial land use planning are designed to follow national land use planning established by the Ministry of Forestry. National spatial planning maps describe various land use zones such as: production forest, conservation forests, protected forests, and agricultural conversion areas. Agricultural conversion areas are designated as the legal zones where agricultural crops such as rubber and palm oil can be planted as permitted at the provincial and district levels. Conversion of forest areas outside of these zones is normally prohibited.

In Central Kalimantan, and Seruyan District, in particular, palm oil development regularly follows a bottom-up licensing process for forest conversion to agriculture. The district government is the first in the chain of approvals to grant a license that follows a typical pattern (shown left).

Thus, at any given time, there are proposed concessions (those holding an Izin Lokasi) and licensed concessions (those holding a HGU) throughout the province, with the majority of these concentrated on the centers of palm oil production. In Central Kalimantan this permitting process constitutes legal palm oil plantation development and most existing palm oil plantations are developed within or adjacent to these boundaries.

Obtaining a legal license by this process takes 2-3 years, so that legal activity shifting, e.g. obtaining a new HGU prior to plantation development, is not expected to occur in less than two years after the project start and planned concessions are canceled.

Monitoring unpermitted (illegal) plantation expansion

There is a substantial amount of spatial data available that can be used to identify potential leakage, including satellite imagery for mapping plantation conversion and GIS data for overlaying mapped concession boundaries and agents. These data provide a direct method of investigating leakage and determining impact area for quantifying carbon stock and emission changes. Satellite image and GIS analysis are especially valuable for monitoring unpermitted plantation expansion beyond their legal boundaries. The series of steps below describes the process of monitoring unpermitted plantation development. These steps operationalize the general methodology requirement to monitor all activity-shifting leakage by the deforestation agent.

Unpermitted plantation expansion monitoring steps

Leakage monitoring for unpermitted plantation expansion is accomplished through a multi-step process that relies primarily on linking actual palm oil conversion derived from satellite image analysis with land-use planning maps and permits. Stratification is employed at Step 3 to focus the leakage analysis and then again in Step 6 to refine impact assessment for carbon stock and emissions changes if leakage is detected. Steps 1-3 are conducted up-front prior to monitoring. Steps 4-6 are conducted every year during monitoring and Steps 7-8 are conducted if Steps 4-6 show the occurrence of leakage.

Establish unpermitted plantation expansion monitoring zone at project start:

STEP 1. Identify agent, assess holdings and operations
STEP 2. Establish agent-specific operational distance monitoring zone for unpermitted plantation expansion
STEP 3. Stratify monitoring zone to define leakage risk areas

Conduct annual monitoring for unpermitted plantation expansion:

STEP 4. Monitor and update permitted concessions maps
STEP 5. Monitor and map actual oil palm plantations(potential leakage sites)
STEP 6. Overlay permitted concessions and actual plantations to determine leakage

Details of unpermitted plantation expansion monitoring process

STEP 1. Identify agent, assess holdings and operations

PT BEST Agro International, a large Oil Palm Conglomerate with long-term lease rights to 15 concessions in Central Kalimantan, 12 of which are already developed to palm oil. The remaining 3 are primarily deforested.

STEP 2. Establish agent-specific operational distance monitoring zone for unpermitted plantation expansion

Palm oil concessionaires rely on transportation infrastructure to haul edible grade oil palm fruit to Crude Palm Oil (CPO) processing mills within 24 hours of harvest. This places a significant operational constraint on concessionaires who must locate plantations close to processing plants especially where road conditions are poor. In Central Kalimantan, this presents an effective operational zone of no more than 100km from palm oil plantation to CPO plant. Illegal plantation expansion, if it occurs, would be expected to occur within these zones.

All of the PT BEST concessions currently under operation were developed around and are dependent on two CPO processing mills, one in Pangkalan Bun and one in Sampit. These locations form the centers of 100km operational constraint zones for monitoring illegal plantation expansion (Figure 19). Note that undeveloped concessions 14 and 15 lie outside of this monitoring zone and are cut off from Sampit by extensive deep swamps of Sebangau National Park. Currently there are no plantations in this region to monitor for expansion and no infrastructure to develop them. These concessions will be monitored as described above and infrastructure development, expected to develop south from Palangakaraya will also be monitored. Should this infrastructure and/or plantations develop during the leakage monitoring period, illegal expansion beyond permitted borders will also be monitored.

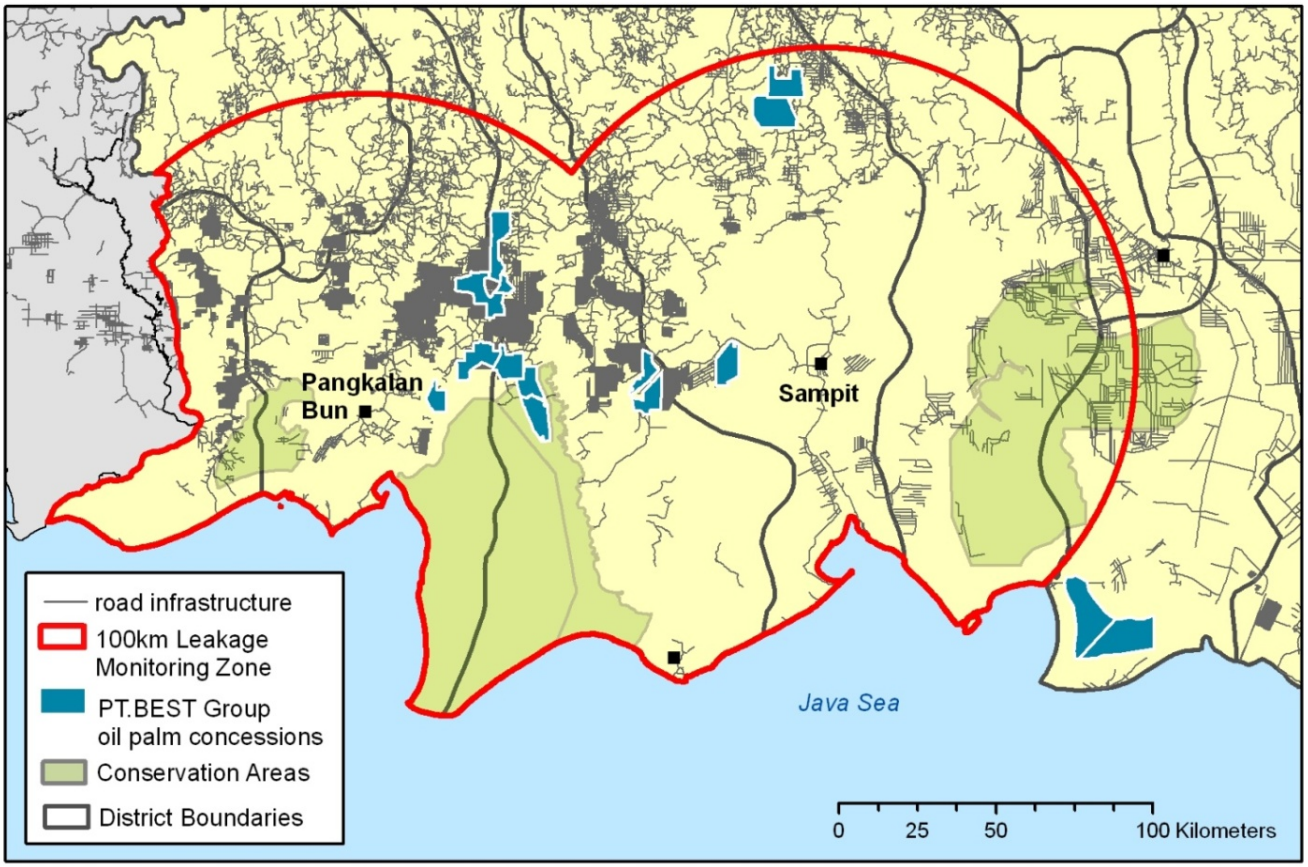


Figure 19. Unpermitted activity shifting leakage monitoring zone for Rimba Raya based on 100km distance from PT BEST Agro's CPO processing mills in Pangkalan Bun and Sampit, Central Kalimantan.

STEP 3. Stratify monitoring zone to define leakage risk areas

The unpermitted plantation expansion monitoring zone is stratified by land use and land planning information in order to focus the area of analysis to those places where leakage could occur. This analysis is carried out in GIS using overlays of spatial data to include or exclude certain layers as follows:

1. Include 100km areas centered on palm oil processing plants in Pangkalan Bun and Sampit
2. Exclude project area (Rimba Raya) and provinces where agent does not operate (West Kalimantan)
3. Include only areas that were forested in 2000
4. Exclude all permitted oil palm concessions at project start (2009 Izin Lokasi and HGU permits)
5. Exclude all existing palm oil plantations at project start (2009 Landsat mapping)

Results of the first three overlays are shown in Figure 20. GIS data layers for HGU and Izin Lokasi permits (Figure 21) were combined then overlaid with monitoring zone forests to exclude all areas already permitted for conversion at the project start. Concession boundaries were buffered by 500 meters in GIS to eliminate errors associated with mapping and reduce the number of "sliver" polygons produced by spatial mismatches in data layers. Tests of buffer distance were conducted to insure that the buffered GIS file captures actual palm oil expansion outside permit boundaries.

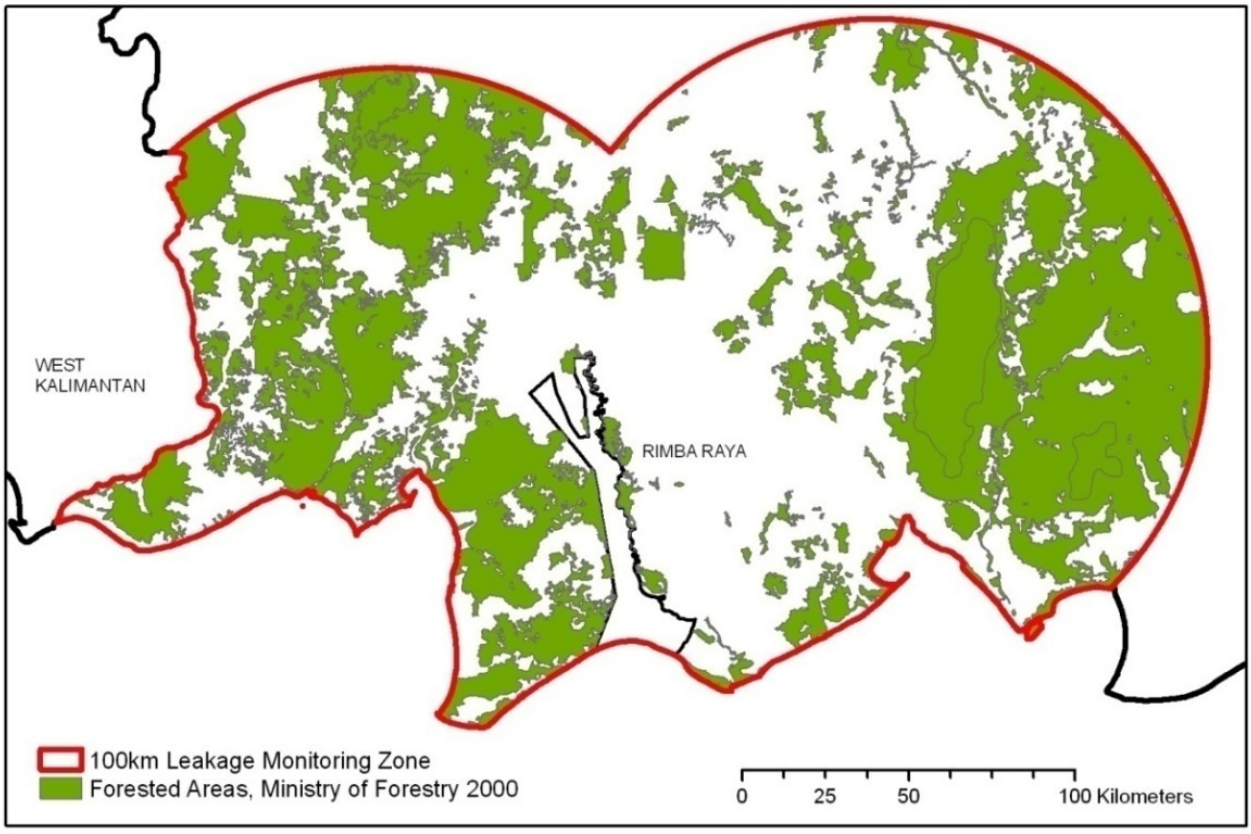


Figure 20. Results of the first three steps of plantation expansion leakage monitoring. Forested areas shown represent existing forest in 2000 for the 100km monitoring zone.

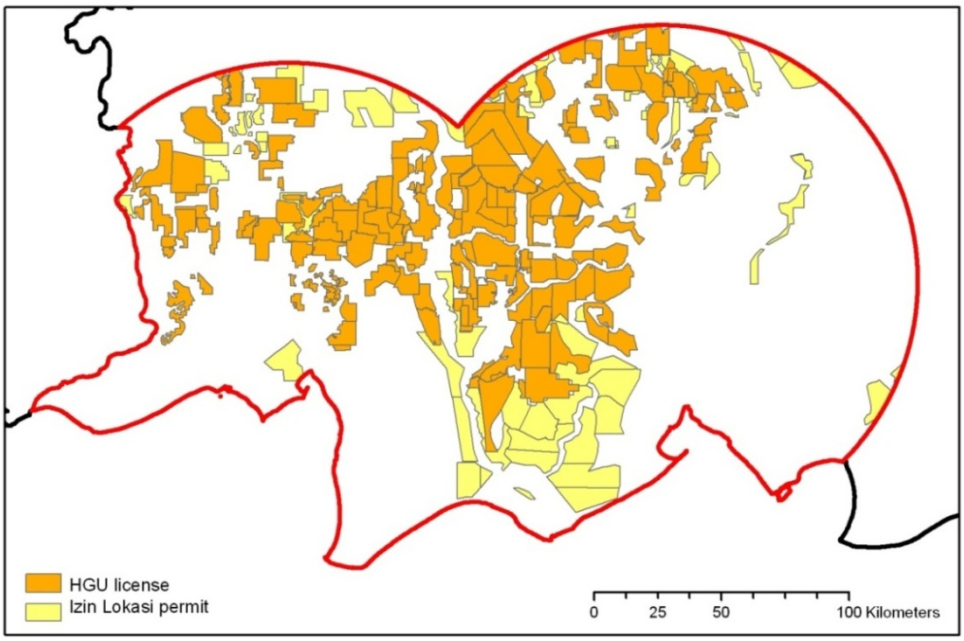


Figure 21. Existing oil palm concession licenses at project start. GIS data represents government mapping obtained through NGOs and represents the best available data as of July 2009.

All existing palm oil plantations in the monitoring zone at project start were interpreted and digitized on Landsat ETM+ satellite imagery (Figure 22). Six scenes were required to cover the monitoring zone and images were searched to find cloud-free images closest to the project start date. Two scenes each from three dates: May 13, June 7 and August 8 were selected and downloaded, bands stacked and geo-referenced if displays saved for import into ArcGIS for digitizing. Palm oil boundaries were conservatively interpreted to include already-constructed plantation blocks. Mapping shows that most HGU concessions have already been converted to plantation and conversely, the majority of palm oil conversion has occurred in or adjacent to permitted concessions. An earlier pilot study outside of PT BEST concessions showed a 15% encroachment in area beyond permitted concessions.

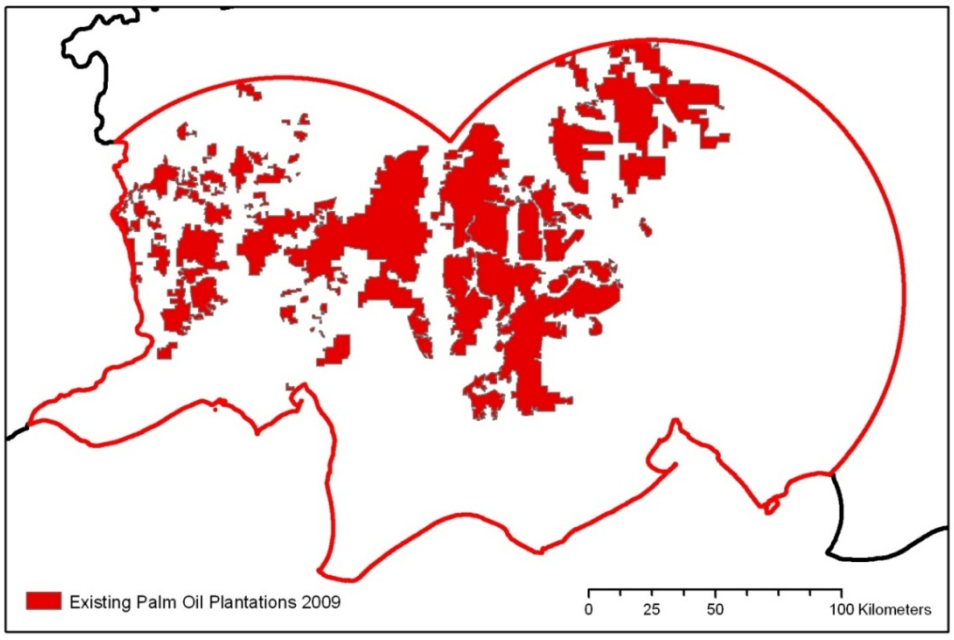


Figure 22. Existing palm oil plantations at project start interpreted and digitized from Landsat 7 ETM+ satellite imagery path-row 118-061 and 118-062 June 7; 119-061 and 199-062 May 13; 120-061 and 120-062 August 8.

After removing permitted and existing palm oil plantations, the remaining areas forested in 2000 are being monitored for plantation conversion and expansion (Figure 23). Note that conservation areas (except the project) are included in leakage monitoring although palm oil conversion is not expected to occur in these areas.

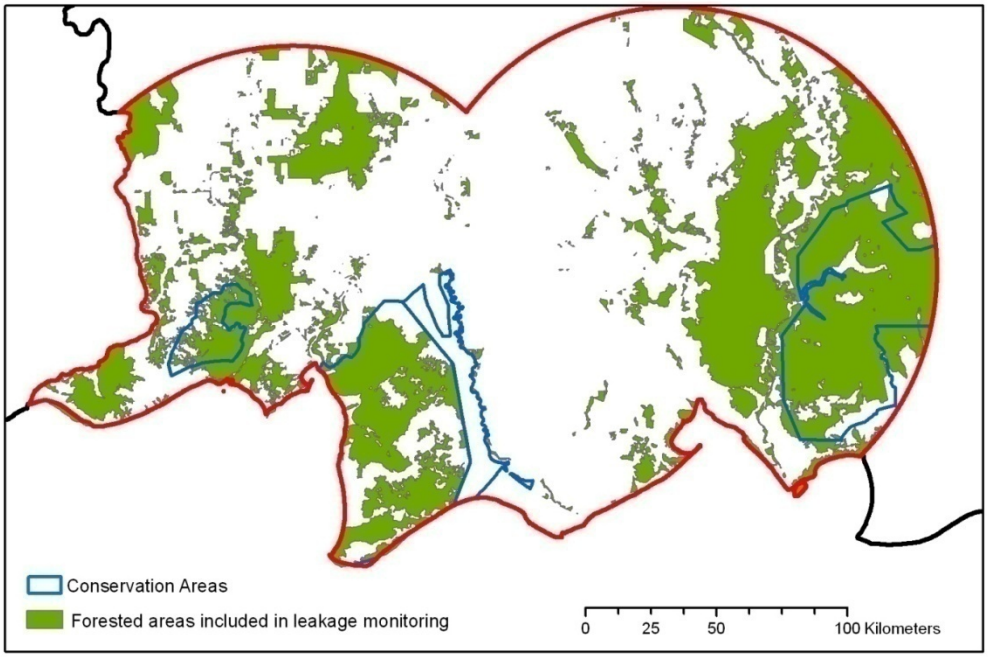


Figure 23. Leakage risk areas representing forests in 2000 inside the 100km distance buffer to CPO plants and excluding permitted concessions and existing plantations. Forests inside conservation areas are also monitored for leakage.

STEP 4. Monitor permits and update concession maps

Researching new licenses and updating GIS data on concession boundaries is the first step of the annual leakage monitoring process. Permits are searched to identify any new license activity by PT. BEST. In Step 3, the current status of existing concessions (holding a HGU) and proposed concessions (holding an Izin Lokasi) was established at both the District and Provincial levels. This map and list of existing and planned conversion areas represents the known area and location of planned land conversion within the District and Province at the project start. The current HGU and Izin Lokasi map (shown in Figure 21) will be updated to add any new license boundaries and improve mapping for existing boundaries consistent with government planning office GIS.

STEP 5. Monitor and update oil palm plantation boundaries(potential leakage sites)

Mapping new palm oil conversion lands consists of overlaying year t mapped plantations onto year t+1 satellite imagery and digitizing all new and/or expanded plantations in the entire 100 km monitoring zone (updating Figure 22). New areas of palm oil plantation are then overlaid with leakage risk areas (Figure 23) to identify all areas of potential leakage on the ground. The example in Figure 24 illustrates this process. In this case, palm oil conversion had begun inside permitted concessions prior to project start, but then expanded beyond concession boundaries and into the leakage risk area where it was detected during the GIS overlay process. The spatial overlay approach facilitates both a visual and quantitative assessment of potential leakage.

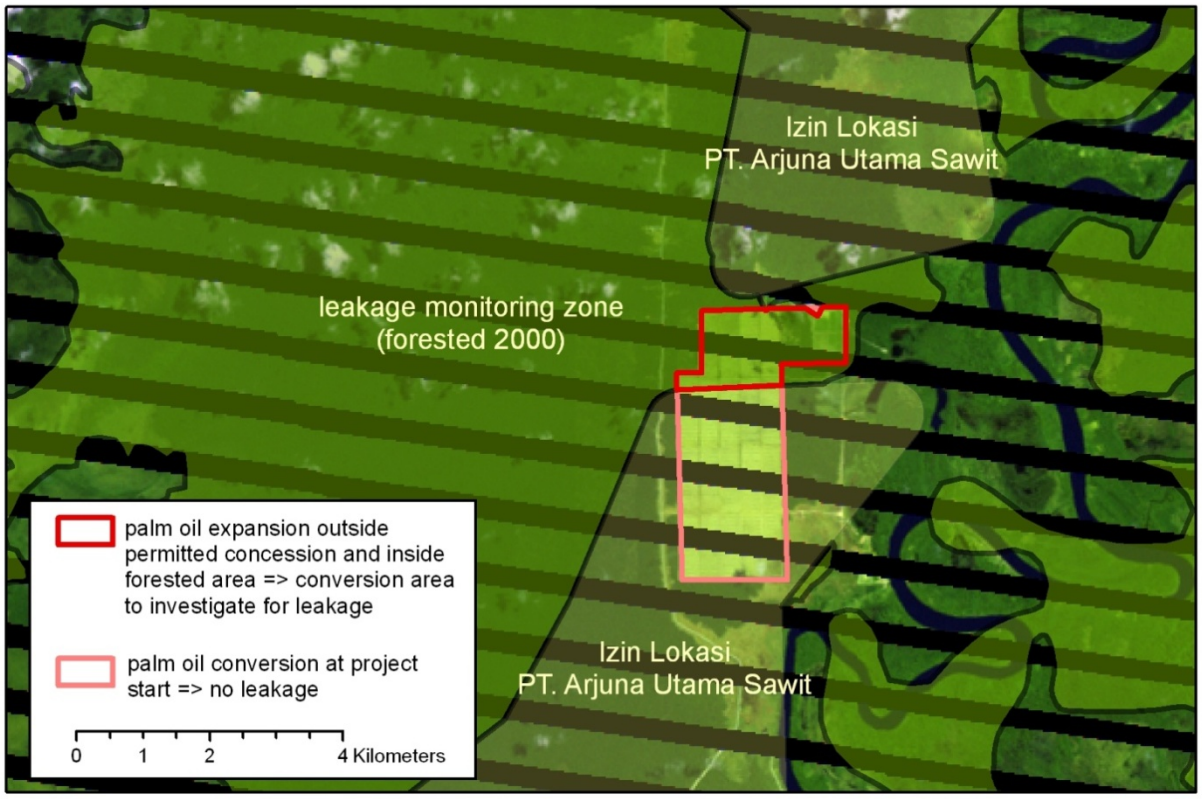


Figure 24. Example of overlay process to detect and highlight new forest conversion to palm oil.

STEP 6. Overlay concession boundaries and palm oil plantationsto determine agent

If new deforestation is detected within the leakage monitoring zone and is confirmed to be new activity outside a pre-existing concession license, then Step 6 is carried out to determine the agent of deforestation. Overlay analysis of updated concession boundaries (Step 4) and palm oil expansion (Step 5) is used to identify the agent or possible agents responsible for conversion. As illustrated in Figure 24, overlaying concession boundaries provides information about agents. In this case, plantation conversion extended 1.5 km between two concessions for which an Izin Lokasi had been granted to PT. Arjuna Utama Sawit. Since this company is not an affiliate of PT BEST, whose closest concession is 75 km distant, we can conclude that PT BEST is not the agent of this conversion and therefore this palm oil expansion does not represent leakage associated with Rimba Raya. If it is determined that PT BEST is the likely agent, then steps 7 and 8 will be carried out to confirm and quantify leakage.

Assess the area of activity shifting leakage and quantify impact to carbon

Any activity shifting leakage detected during monitoring including leakage in existing or new PT BEST concessions and unpermitted plantation conversion, will be assessed and reported annually in accordance with the methodology.

Conduct site-level analysis to confirm leakage and stratify area

If it is determined that PT BEST is the likely agent of leakage, then a site-scale analysis is conducted to confirm the agent and develop data for carbon accounting. First, the boundary of the new or expanded palm oil concession will be delineated using concession permit maps and the best available satellite imagery. Then the leakage area will be stratified using the same procedures and vegetation classes as used for Rimba Raya.

Assess net carbon stock changes and GHG emissions associated with leakage

Following leakage area delineation and stratification, carbon stock changes and continued GHG emissions will be calculated according to the methodology. Emissions that result from displacement of pre-project activities to areas outside the project boundary are estimated as:

$$LK = \sum_{i=1}^{i} \sum_{t=1}^{t^*} LKA_{i,t} \cdot \Delta C_i$$

where:

LK	= Leakage emissions resulting from displacement of economic activities; tCO_2e
$LKA_{i,t}$	= the area of activity shifting leakage in stratum *i*, at time *t*; ha
ΔC_i	= average carbon stock changes and greenhouse gas emissions in all pools in stratum *i*, $tCO_2e\ ha^{-1}$
i	= 1, 2, 3, …, m_{LK} leakage strata
t	= 1, 2, 3, …, *t** years elapsed since the start of the project activity

Monitoring Period and Reporting

The area of activity shifting leakage will be assessed for five full years beyond the date at which deforestation was projected to occur (July 2009). And emissions resulting from activity shifting will be tracked beyond the initial year of clearing as required and described by the Methodology Section 10.2.2.

At each verification, documentation will be provided covering lands controlled by PT BEST where leakage could occur, including their location, area and type of existing land use(s) and management plans. The status of government permits that have been granted to PT BEST will also be reported.

Market Leakage Deduction (not monitored)

In accordance with the methodology, a deduction against the biomass of timber extracted under the baseline scenario must be estimated for Market Leakage by implementing steps outlined in the methodology:

Section 10.1 of the Methodology

When REDD project activities result in reductions in wood harvest, it is likely that production could shift to other areas of the country to compensate for the reduction. Therefore, in cases where the project area would be harvested for commercial timber before clearing the site for a new land use, market effects leakage must be estimated as the baseline emissions from logging multiplied by a leakage factor:

$$LK_{MarketEffects} = \sum_{t=1}^{t^*} \sum_{i=1}^{m_{LK}} LK_{ME,it} \quad (66)$$

$$LK_{ME,it} = LF_{ME,i} * C_{B,XBT,it} \quad (67)$$

Where:

$LK_{MarketEffects}$ = Total GHG emissions due to market effects leakage through decreased harvest; t CO_2e

$LK_{ME,it}$ = Total GHG emissions due to market effects leakage through decreased harvest in stratum i at time t; t CO_2-e

$LF_{ME,i}$ = Leakage factor for market effects calculations; dimensionless

$C_{B,XBT,it}$ = Carbon emission due to displaced timber harvests in the baseline scenario in stratum i at time t; t CO_2-e

The amount of leakage is determined by where harvesting would likely be displaced to. If in the forests to which displacement would occur a lower proportion of biomass in commercial species is in merchantable material than in the project area, then more trees will need to be cut to supply the same volume and thus higher emissions should be expected. In contrast, if a higher proportion of biomass of commercial species is merchantable in the displacement forest than in the project forest, then a smaller area would need to be harvested and lower emissions would result.

Each project thus shall calculate within each stratum the proportion of total biomass in commercial species that is merchantable (*PMPi*). Merchantable biomass per stratum is conservatively defined as the total volume (converted to biomass) of all commercially valuable trees within a stratum that are above the minimum size class sold in the local timber market (see Applicability Condition J). *PMPi* is therefore equal to the merchantable biomass as a proportion of total aboveground tree biomass for stratum *I* within the project boundaries. *PMPi* shall then be compared to the mean proportion of total biomass that is merchantable for each forest type (*PMLFT*) to which displacement is likely to occur.

The following deduction factors ($LF_{ME,i}$) shall be used:

PML_{FT} is equal (±0.15) to PMP_i	$LF_{ME,i}$ =	0.4
PML_{FT} is > 0.15 less than PMP_i	$LF_{ME,i}$ =	0.7
PML_{FT} is >0.15 greater than PMP_i	$LF_{ME,i}$ =	0.2

Where:

PML_{FT} = Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type; dimensionless

PMP_i = Merchantable biomass as a proportion of total aboveground tree biomass for stratum i within the project boundaries; dimensionless

$LF_{ME,i}$ = Leakage factor for stratum i market-effects calculations; dimensionless

Instead of applying the default market leakage discounts, project proponents may opt to estimate the project's market leakage effects across the entire country and/or use analysis(es) from other similar projects to justify a different market leakage value. A description of the market leakage assessment, including steps for determining where leakage is likely to occur (i.e., to which forest types leakage is likely to occur) and what the carbon stocks of those lands are, shall be outlined in the PDD. The outcome of this assessment conducted at first VCU issuance (whether using default discounts or project specific analysis(es)) shall be subject to the VCS double approval process. Market leakage assessments conducted at validation stage and at verification other than the first VCU issuance are not required to undergo the double approval process.

The next step is to estimate the emissions associated with the displaced logging activity – this is based on the total volume that would have been logged in the project area in the baseline scenario. The emission due to the displaced logging has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction:

$$C_{B,XBT,it} = \left(\left[V_{B,it} * \phi_i * CF\right] + \left[V_{B,it} * LDF\right]\right) * \frac{44}{12} \quad (68)$$

Where:

$C_{B,XBT,it}$ = Carbon emission due to displaced timber harvests in the baseline scenario in stratum i at time t; t CO_2-e

$V_{B,it}$ = Volume to be extracted under the baseline scenario in stratum i at time t; m^3

ϕ_i = volume-weighted average wood density; t d.m. m^{-3} merchantable volume

CF = carbon fraction of dry matter (0.5 t C / t biomass); dimensionless

LDF = Logging damage factor; t C m^{-3} (default 0.37 t C m^{-3})

i = 1, 2, 3, ..., m_{BL} baseline strata

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

The total volume to be extracted under the baseline scenario in stratum *i* at time *t* (*VB,it*) can be estimated by multiplying the plot-level volume per stratum (*MVB,it* see Eq. 34) by the area cleared or logged in stratum *I* at time *t* (A cleared ,it or A logged B,it)

The logging damage factor (*LDF*) is a representation of the quantity of emissions that will ultimately arise per unit of extracted timber (m^3). These emissions arise from the non-commercial portion of the felled tree (the branches and stump) and trees incidentally killed during tree felling. The default value given here comes from the slope of the regression equation between carbon damaged and volume extracted based on 534 logging gaps measured by Winrock International in Bolivia, Belize, Mexico, the Republic of Congo, Brazil, and Indonesia.

Leakage from Market Effects was taken as one-time[23] deduction of -4,836,855 t CO2e.

3.6 Data/Parameters to be Collected and Archived for Leakage Monitoring

Methodological pathways for leakage monitoring (Figure 25) are taken from the conceptual diagram in the methodology p. 51. Specific data collected for monitoring leakage GHG emissions are summarized in Table 14 below. These data/parameter tables expand on those in the methodology to include value used, assumptions and decisions, uncertainty estimate and deviation information. There were no deviations in leakage monitoring pathways.

[23] Market leakage is not monitored but is taken as a one-time, up front over a five-year period coinciding with estimated clearing rates and time periods.

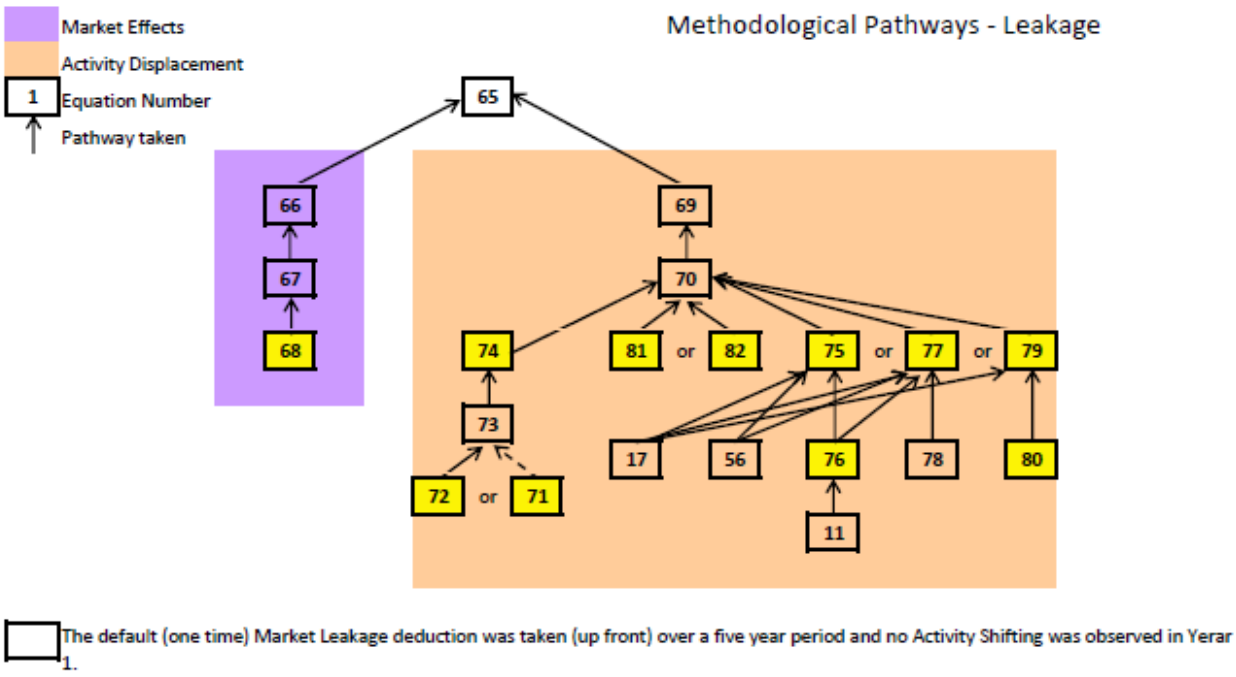


Figure 25. Methodological pathways used to calculate leakage GHG emissions avoided. Pathways included in one-time market leakage calculations and annual project leakage monitoring are shown as solid line arrows. Pathways not included are shown as dotted line arrows.

Note that all pathways are implemented only as required each year. Most pathways in activity shifting leakage remain undetermined since activity may take place under a variety of conditions. For example equation 81 quantifies leakage emissions on peat whereas equation 82 is applicable to leakage emissions on mineral soils.

Equations that include at least one parameter for which uncertainty estimation is required are shown in yellow boxes. Uncertainty estimation was conducted in accordance with the methodology and is presented in the parameter table below. Note that since this methodology is only applicable to projects where deforestation is planned and projected to occur within 10 years of the project start date (Applicability Condition D), **uncertainty in deforestation rate is assumed to be zero** (methodology p. 53). To demonstrate the most likely deforestation rate scenario, an analysis of recent palm oil conversion by the agent of deforestation was conducted. These GIS-based calculations are estimated to be > 90% accurate as described below. GIS-based parameters for ex ante calculations fall into one of two cases, which are referenced in the parameter table:

- Case 1. Area cleared, logged or planted (2,800 ha/yr): These parameters are based on the actual rate of clearing by the deforestation agent, determined from analysis of Landsat data. Landsat is the primary tool for mapping tropical deforestation (Defries et al. 2005) and has been validated against high resolution imagery to be 92-97.5% accurate (NASA accessed January 15, 2011 http://www.glcf.umd.edu/data/paraguay/description.shtml).

- Case 2. Area drained: Drainage area is based on stratification of peat/non-peat which derives from landcover stratification where non-peat types (Kerangas Forest and Open Kerangas Scrub) were differentiated from all other types with 92% producer's accuracy and 98.5% user's accuracy.

Table 14. Data collected and archived for leakage GHG emissions avoided

Data/parameter 1	$A_{cleared\ B,it}$
Data unit:	Ha
Used in equations:	73
Description:	Average annual area of deforestation by the baseline agent of deforestation for the 5 years prior to project implementation
Source of data and reference:	GPS coordinates and/or remote sensing data and or/legal parcel records
Measurement procedures: (if any)	
Value used:	Rate 2,800 ha/yr (stratum i, time t)
Comment:	See baseline parameters 2, 9
Assumptions and Decisions	The expected annual rate of conversion was determined by analyzing historical rate of conversion by the baseline agent.
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 2:	$A_{defLK,\ t}$
Data unit:	Ha
Used in equations:	74
Description:	The total area of deforestation by the baseline agent of the planned deforestation at time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	
Value used:	
Comment:	Legal records will include government permits to deforest including concession licenses
Assumptions and Decisions	
Uncertainty estimate:	Required. Zero. No area of deforestation (leakage) was observed.
Deviation from Methodology:	None

Data/parameter 3:	*WoPA*
Data unit:	Ha
Used in equations:	71
Description:	Total (cumulative) area of forest cleared by the baseline agent of planned deforestation in stratum *i* at time *t*
Source of data and reference:	Analysis of remote sensing data and/pr legal records and /or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	

Value used:	
Comment:	
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 4:	*HistHa*
Data unit:	Ha
Used in equations:	72
Description:	Average annual area of deforestation by the baseline agent of deforestation for the 5 years prior to project implementation
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	
Value used:	6113.7
Comment:	Same as baseline parameter 47. See discussion on deforestation rate section 4.2
Assumptions and Decisions	
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 5:	PMP_i
Data unit:	%
Used in equations:	Unnumbered Eq. p. 41
Description:	Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundaries
Source of data and reference:	Field measurements from Mawas logging gap assessment (Winrock 2008)
Measurement procedures: (if any)	
Value used:	Mean 0.36, SD 0.169
Comment:	Same as B logged (Biomass Extracted as Merchantable Timber >30cm in Timber Extraction spreadsheet
Assumptions and Decisions	Mawas data provides complete dataset applicable to Rimba Raya project site. Average proportion of merchantable timber across 93 logging gaps
Uncertainty estimate:	Mean = 0.36, SE = 0.0176, n=93. Uncertainty (90%CI/mean*100) = 8.04%
Deviation from Methodology:	None

4. GHG Emissions Reductions

This section includes an explanation of the methodology (4.1), quantifying GHG emissions and removals for the baseline scenario (4.2), and quantifying GHG emissions and removals for the project (4.3), including a one-time[24] market leakage deduction from baseline emissions. Section 4.4 summarizes Ex Post net GHG emissions avoided (Baseline minus Project minus Leakage deductions).

Calculations are summarized in each subsection and can be found in the associated Excel spreadsheet titled **Baseline Calculations for Rimba Raya_2011.05.15_Final.xls** (Annex 8a). Methodological pathways taken and parameter descriptions for all baseline calculations are included in Section 4.5. The Baseline Report titled **Rimba Raya Baseline Report_2011.05.15_Final.pdf** (Annex 8b) should be referenced for a more complete description of how GHG emissions reductions were quantified.

4.1. Explanation of methodological choice

The methodology for this project follows the Approved VCS Methodology ***"VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1-0".*** The full report[25]of the methodology should be used as a reference when reading this section along with the Final Baseline Emission Estimate for the PT Rimba Raya Restoration Concession[26].

The selected methodology is currently the only VCS-approved methodology for avoided deforestation in peat swamp forests and was designed for the Mawas peat swamp, an ecosystem almost identical to Rimba Raya that is located less than 150km from the project site. Rimba Raya project activity is focused on peat swamp forest conservation in an area that was slated for conversion to palm oil plantations by the Indonesian government. The project will directly avoid GHG emissions from clearing, fire, drainage and conversion of peat forest to oil palm estates.

4.2. Quantifying GHG emissions and/or removals for the baseline scenario

In accordance with the methodology, five main steps were taken to estimate baseline net avoided GHG emissions:

1. Stratification and sampling;
2. Assessment of deforestation and conversion rate;
3. Assessment of mean carbon stocks in aboveground biomass, including two components:
    a. Tree biomass; and
    b. Non-tree biomass
4. Estimation of GHG emissions from changes in aboveground biomass, including four components:
    a. emissions from timber extraction before land clearing;
    b. emissions from burning remaining aboveground biomass for land clearing;
    c. sequestration by replacement vegetation (palm oil); and
    d. emissions from harvest rotations. (As palm oil plantations operate on a 25-30 year timeframe, and as data are not available for quantifying carbon emissions associated with decaying trees and harvest rotation activities at the end of this cycle, emissions from

[24] Market leakage is assessed up-front and not monitored. The "one-time" deduction is taken over a period of five years in concurrence with predicted rate of deforestation/timber extraction and consistent with rate of timber extraction in the baseline.
[25] Methodology accessed September 30, 2010 at http://www.v-c-s.org/VM0004.html
[26] Final Baseline GHG Emission Estimates for the PT Rimba Raya Conservation Project, Version 8.0

harvest rotations were conservatively excluded from calculations and biomass and carbon accumulation conservatively extrapolated to 30 years and included in the baseline).

5. Estimation of GHG emissions from peat, including two components:
    a. emissions from burning for site preparation; and
    b. emissions from drainage.

Each of these steps and components is summarized below with reference to more detailed discussions in the Baseline Report and other supporting technical documents.

4.2.1Stratification and sampling

Geo-referenced spatial datasets were used to stratify the project area by palm oil concession and land cover/peat distribution. Land cover and proposed palm oil concession strata summarized in Table 15 were used as the basis for area assessments of annual baseline emissions. It was assumed that conversion of these areas would have occurred in a sequential manner starting with the two northernmost estates, PT. Borneo and PT. Graha proceeding the following year with the next two estates. Maps and descriptions of project strata are presented in Section 1.5 (oil palm concession boundaries) and Section 1.7 (land cover classification and peat distribution).

Sampling of carbon stock inventories was conducted in plots on permanent transects to validate an aerial-based biomass assessment in all land cover classes. Stratified random aerial image plots were used to quantify carbon stocks based on the Broadbent et al. (2008) regression equation relating tree crown area delineated in aerial image sample plots to biomass.

Stratification and sampling methods are described in detail in the Baseline Report.

Table 15. Land Cover/Land Use Classes in Proposed Palm Oil Concessions
These represent the two strata used to estimate baseline emissions. Extent and type of land cover classes described in the Land Cover Assessment and Land Cover Accuracy Assessment reports.

Land Cover/Land Use Classes	PT. BORNEO EKA SAWIT TANGGUH (ha)	PT. GRAHA INDO SAWIT ANDAL TUNGGAL (ha)	PT. RIMBA SAWIT UTAMA PLANINDO (ha)	PT. WAHANA AGROTAMA MAKMUR PERKASA (ha)	Total (ha)
Peat Swamp Forest (lightly degraded)	5,718	8,302	97	4,911	**19,028**
Peat Swamp Forest Degraded (highly)	427	97	27	1,183	**1,734**
Peat Shrubland (<20% Tree Cover)	314	3,265	3,104	5,464	**12,147**
Kerangas Forest	142	0	4,494	174	**4,810**
Kerangas Open Scrub	774	328	3,959	368	**5,429**
Low, sparse vegetation cover	944	33	0	365	**1,342**
Seasonally Inundated Wetlands	924	552	0	1,228	**2,704**
Open Water	43				**43**
Grand Total	**9,286**	**12,577**	**11,681**	**13,693**	**47,237**

4.2.2 Assessment of Deforestation and Conversion Rate

The rate of plantation conversion was analyzed in order to incorporate the rate of aboveground biomass emissions into annual baseline emissions estimates for timber extraction, biomass burning, peat burning, peat drainage and palm oil growth/sequestration.

To gain a transparent and conservative estimate of the annual rate of conversion expected for Rimba Raya concessions formerly held by PT. BEST, a satellite image-based GIS analysis was conducted. Eleven of 15 existing PT BEST concession areas were examined by overlaying concession boundaries on Landsat imagery, to delineate plantation boundaries in each year from 2003 to 2009.

Three of the estates in this study were already developed by 2003 and one remained undeveloped in 2009 (Figure 26). The remaining seven estates were developed 2003-2009 (Figure 27). All concessions examined are within 100 km of the project and are located on single Landsat ETM+ scene at path-row 119-62. Image dates were: April 2003, August 2004, March 2005, May 2007, January 2008, and February 2009.

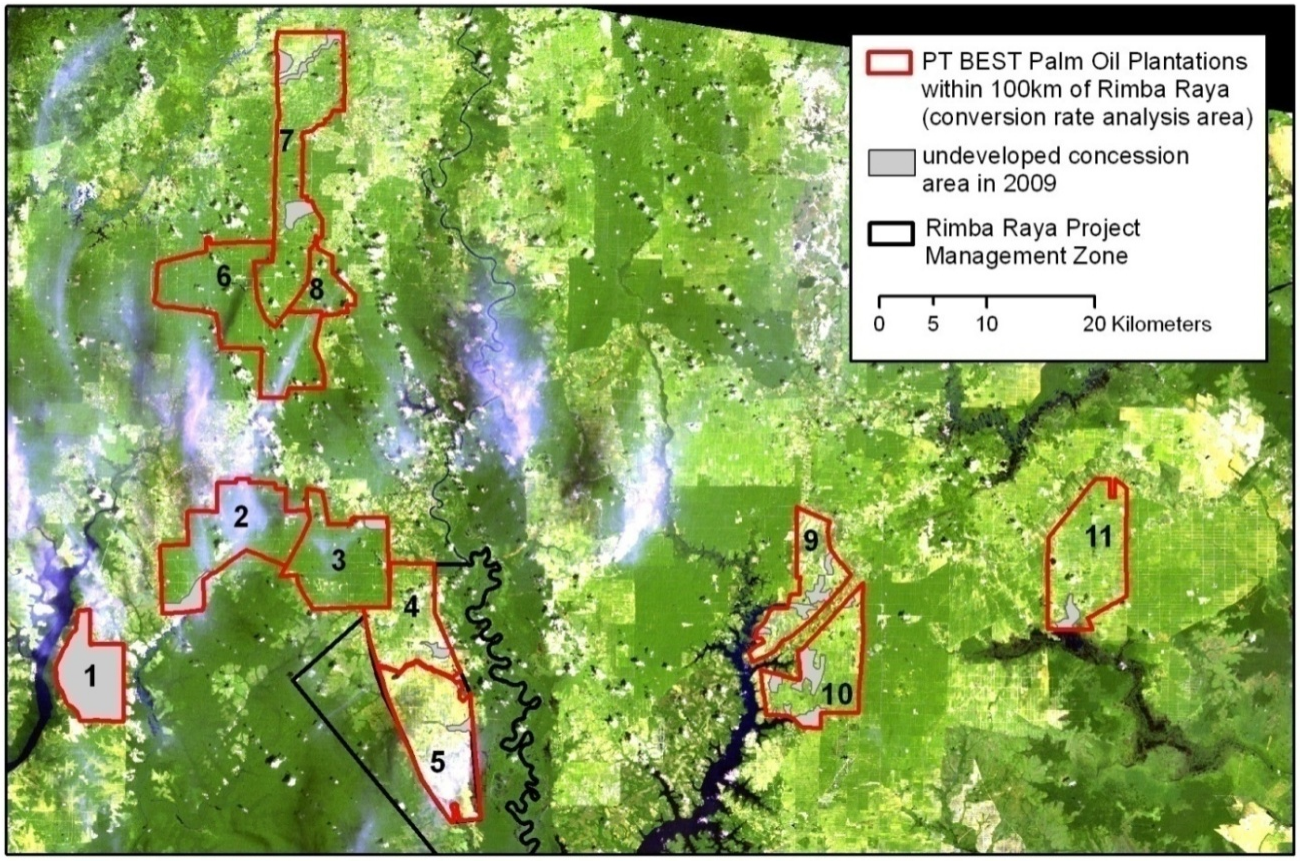


Figure 26. PT BEST palm oil plantations within 100km of Rimba Raya. These 11 concessions were analyzed for rate of conversion to plantation (See Table below for estate names).

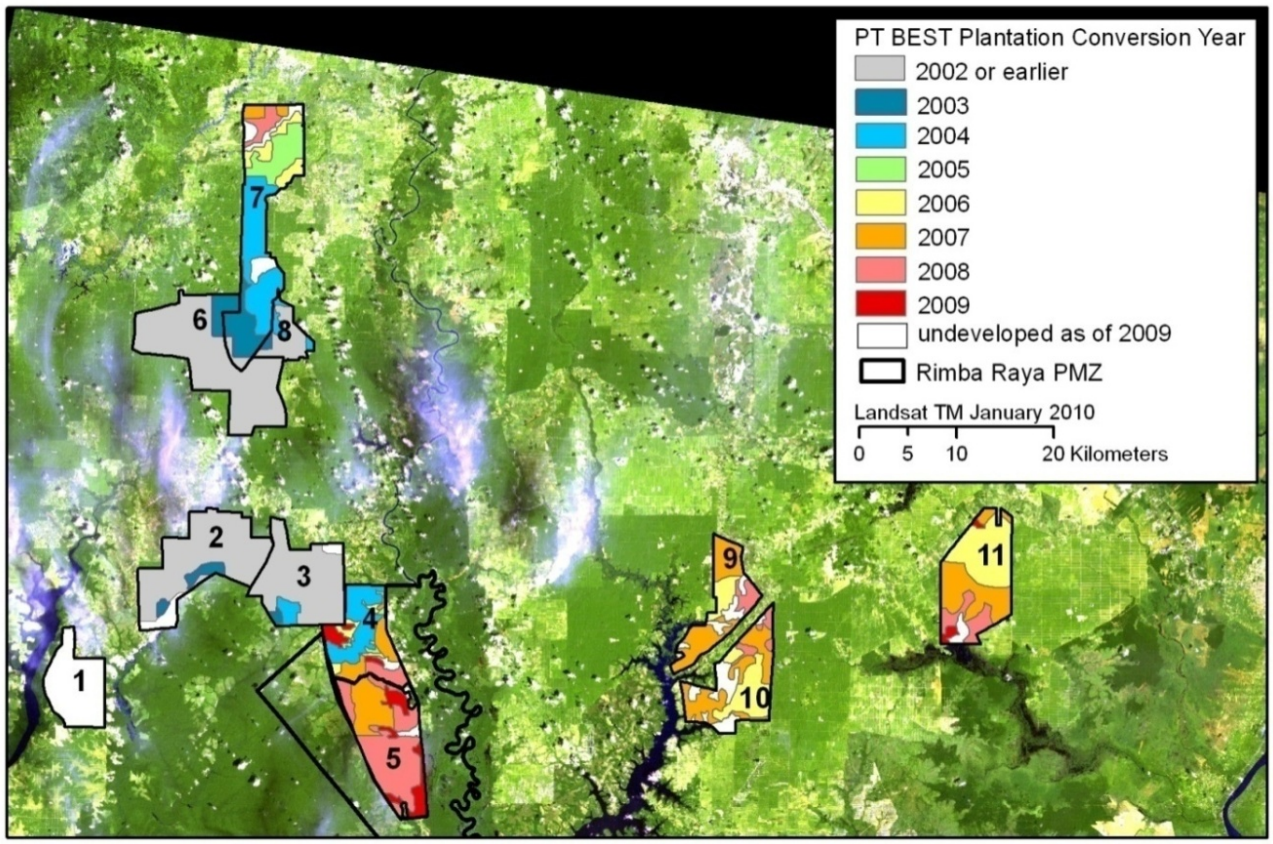


Figure 27. PT BEST plantation conversion year for 11 estates within 100km of Rimba Raya. (See Table below for estate names).

Results show that the average area under conversion during this period was 6,114 ha/year (Table 16). Inter-annual variation is due to concessions being in various stages of the 3-4 year conversion process in any given year. For example, in 2005, development on PT. Wanasawit was stalled and PT. Bangun Jaya Alam already completed, so overall plantation area increased by only 2,123 ha that year. In 2006, after obtaining licenses for 3 adjacent estates under the company name PT. Hamparan Masawit Bangun Persada, development increased dramatically to 7,948 ha/yr and peaked in 2008 at 11,569 ha/yr when all 6 estates were being planted concurrently.

By concession, 74.1% of the estate areas were developed to oil palm within the first two years, representing an average annual conversion rate of 2030.2 ha/yr in Year 1 and 2868.3 ha/yr in Year 2 (Table 17). By Year 3, these estates were 88% built out and nearly completed (94% built) by Year 4.

It is expected that the former concessions comprising Rimba Raya were slated to begin focused development in 2009 as the three large concessions to the east comprising PT. Hamparan Masawit Bangun Persada, were already totally developed and KUCC north and south were finishing development. (Note that the other four concessions not included in this quantitative analysis are two fully developed estates 50km to the north and two undeveloped estates (with no surrounding infrastructure) 135 km to the southeast.

Table 16. Annual Area of Conversion by Estate

Historical Area of New Conversion by the Baseline Agent of Deforestation											
Map #	Estate Name	already converted in 2002	2003	2004	2005	2006	2007	2008	2009	remaining undeveloped in 2009	Grand Total
1	PT. WANA SAWIT SUBUR LESTARI SK74 north	0								4486.6	**4486.6**
2	PT. WANA SAWIT SUBUR LESTARI SK74 south	7663.9	501.3							670.4	**8835.5**
3	PT. WANA SAWIT SUBUR LESTARI SK73	6402.4	150.4	507.7						229.6	**7290.1**
4	PT. WANASAWIT SUBUR LESTARI KUCC north	0		2432.2	250	486.4	1166.3	619.8	570.5	183.1	**5708.3**
5	PT. WANASAWIT SUBUR LESTARI KUCC south	0					1866.1	4729.3	1347.6	217.6	**8160.6**
6	PT. BANGUN JAYA ALAM PERMAI south	10049.5	774.3								**10823.8**
7	PT. BANGUN JAYA ALAM PERMAI north	356.5	1595	4141	1873.6	1172.4	447.5	652		1119.6	**11357.5**
8	PT. BANGUN JAYA ALAM PERMAI east	1532.2	120.3	463.3							**2115.9**
9	PT. HAMPARAN MASAWIT BANGUN PERSADA north	0				766.1	2599.7	553		719.2	**4638.1**
10	PT. HAMPARAN MASAWIT BANGUN PERSADA south	0				2123.2	2577.4	526.2		1414.9	**6641.7**
11	PT. HAMPARAN MASAWIT BANGUN PERSADA east	0				3399.9	2912.3	1194.7	276.2	351.8	**8134.9**
Grand Total	Total conversion by calendar year	**26004.4**	**3141.3**	**7544.2**	**2123.6**	**7948**	**11569.2**	**8275.1**	**2194.3**		**78193**
	average conversion (ha/yr) 2003-2009										**6113.7**

Table 17. Area of Conversion by Plantation Year

	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	total 2009
KUCC N	2431.2	250.0	486.4	1166.3	619.8	570.5	5525.2
KUCCC S	1866.1	4729.3	1347.6	BUILT	BUILT	BUILT	7943.0
BANGUN north	1595.0	4141.0	1873.6	1172.4	447.5	652.0	10238.0
HAMP north	766.1	2599.7	553.0	BUILT	BUILT	BUILT	3918.9
HAMP south	2123.2	2577.4	526.2	BUILT	BUILT	BUILT	5226.8
HAMP east	3399.9	2912.3	1194.7	276.2	BUILT	BUILT	7783.1
Average ha/yr	2030.2	2868.3	996.9	435.8	177.9	203.8	
Average % developed	31.2%	74.1%	88.0%	94.0%	97.2%	100%	
sd	12.7	16.8	17.5	8.8	4.3	0	

se	5.2	6.8	7.1	3.6	1.8	0	
uncertainty	22	11.5	10	5.6	3.5	1.7	
lowest expected rate	18.4%	57.3%	70.6%	85.3%	92.4%	100%	

Note that proposed concessions for Rimba Raya are 75% larger than previously developed concessions (avg 11,809 ha compared to avg 6,746 ha).Rapid build-out on relatively small concessions limits conversion rate analysis based on annual area of conversion. In order to extend this analysis to future scenarios, the cumulative proportion of build-out is applied to Rimba Raya concessions, shown in Table 18.

Table 18. Average Percent Area Developed applied to Rimba Raya Concessions

AVERAGE						
	yr1	yr2	yr3	yr4	yr5	yr6
RR1	2884.6	6878.9	8176.9	8740.8	8984.6	9286.0
RR2	3906.9	9316.8	11074.9	11838.6	12168.7	12577.0
RR3	3628.6	8653.1	10285.9	10995.2	11301.8	11681.0
RR4	4253.6	10143.6	12057.6	12889.1	13248.5	13693.0
total	14673.7	34992.4	41595.3	44463.8	45703.6	47237.0

There is a moderate amount of variation and uncertainty associated with these averages in Table 17, so to incorporate this uncertainty for a conservative estimate of development rate, the low expected average % development (18.4% in year 1, 57.3% in year 2 etc) was applied to RR concessions to quantify minimum expected rate of development (Table 19).

Table 19. Minimum expected Conversion Rate for Rimba Raya Concessions

LOW	yr1	yr2	yr3	yr4	yr5	yr6
RR1	1707.2	5322.3	6553.2	7923.0	8583.1	9286.0
RR2	2312.2	7208.6	8875.7	10731.0	11624.9	12577.0
RR3	2147.5	6695.0	8243.4	9966.5	10796.8	11681.0
RR4	2517.4	7848.2	9663.3	11683.2	12656.4	13693.0
total	8684.2	27074.1	33335.7	40303.8	43661.2	47237.0

This scenario accounts for the uncertainty around the mean proportion of area converted. From these data its evident the rate of development is not linear, peaking around year 2 then tapering close to build-out. However, applying a linear deforestation rate is conservative and makes baseline calculations more straight-forward and transparent. By delaying expected plantation development in the south (concessions 3 and 4) by one year and by applying a linear rate of conversion of 2,800 ha per year, the baseline scenario shows a 6-year build-out scenario similar to that of the expected rate under the maximum level of uncertainty (Table 20). This rate of deforestation, **2,800 ha per year** is used to estimate baseline CO_2 emissions.

Table 20. Baseline Scenario Oil Palm conversion and Deforestation Rate

BASELINE	yr1	yr2	yr3	yr4	yr5	yr6
RR1	2800.0	5600.0	8400.0	9286.0	9286.0	9286.0
RR2	2800.0	5600.0	8400.0	11200.0	12577.0	12577.0
RR3		2800.0	5600.0	8400.0	11200.0	11681.0
RR4		2800.0	5600.0	8400.0	11200.0	13693.0
TOTAL	5600.0	16800.0	28000.0	37286.0	44263.0	47237.0

4.2.3 Assessment of mean carbon stocks in Aboveground Biomass

Mean carbon stocks in aboveground biomass are expressed as the sum of biomass in the tree and non-tree components:

$$MC_{B,AG,it} = MC_{B,AG\_tree,it} + MC_{B,AG\_nontree,it} \quad (17)$$

where:

$MC_{B,AG,it}$ = Mean carbon stock in above-ground biomass under the baseline scenario in stratum i, time t, t C ha^{-1}.

$MC_{B,AG\_tree,it}$ = Mean aboveground biomass carbon stock in tree biomass in stratum i at time t, t C ha^{-1} (Eq. 33, 34, or 39)

$MC_{B,AG\_nontree,it}$ = Mean aboveground biomass carbon stock in non-tree biomass in stratum i at time t, t C ha^{-1} (Eq. 18)

Estimations of these components are summarized below and described in detail in the Baseline Report.

4.2.3.1 Tree Biomass

The methodology provides three alternatives for measuring aboveground tree biomass. Given the large extent and inaccessibility of Rimba Raya's peat swamp forests, the Aerial Image Method (AIM) was selected as recommended in the methodology (see p. 20). Methods applied are based on Brown et al. (2005) and Slaymaker (2003) and the original technical work was conducted by Forest Carbon. AIM steps and deviations are summarized below and described in more detail in the Baseline Report. Also see methodological pathways diagram and data parameters table in section 4.5.

AIM Step 1. Tree biomass surveys were conducted in permanent plots on eight transects distributed throughout the Carbon Accounting Area. Measurements were made of tree diameter (D), tree height (H) and tree crown area (A). Field protocols followed standard forestry procedures and are described in the carbon survey SOP (Annex 3). Field methods were identical to those prescribed in the methodology except for slight differences in measurements of tree height (calculated from distance to stem and angles to base and top of tree – deviation in eq.26) and crown area (measured at 2 points rather than 4 - deviation in eq. 23). These deviations did not affect biomass estimates as neither parameter was used in the selected biomass model.

AIM Step 2. Allometric relationships were created to relate Tree Biomass to some combination of Tree Height (H) and /or Tree Crown Area (A) from ground plot data. All equation types were tested using all data and species-specific models were constructed using 16 of the most common species. Results of regression analysis showed that tree species diversity and variation in allometries limited the explanatory power of a single site-

specific regression model (R2 = 0.379) . Broadbent et al (2008) conducted a similar exercise but for a larger dataset in the neotropics for the purpose of applying a site-specific regression model to aerial image data. The Broadbent model represents a good alternative to site-specific model and was applied as a deviation in AIM Step 2. In order to account for possible over-estimation of biomass, the results were then calibrated to match biomass estimated from ground-plot data. Results of biomass estimation were reduced over landcover classes by 22.85%, ensuring a conservative estimate.

AIM Step 3. Aerial photography was flown of the project area to collect high resolution imagery in systematically spaced transects over Rimba Raya concession. A total of 3,380 photographs were taken over Rimba Raya, each one covering approximately 120 ha, with a focus on the carbon accounting area. Photos were ortho-rectified in preparation for tree crown assessment.
AIM Step 4. ArcGIS software was used to view and analyze aerial imagery. 2D aerial image files were processed since only tree crown (not tree height) was used in biomass estimation modelling as allowed by the methodology.

AIM Step 5. Virtual plots were established on images in a stratified random manner. 1ha square plots were systematically installed at the center of each photo to avoid any effects from lens distortion.

The sampling framework followed methodology requirements as follows:

Sample size was established by conducting a pilot study with n=20 plots for each land cover strata and calculating biomass variance. A 10% sample error with a 90% Confidence Interval was applied to generate the number of plots needed in each strata. A total of 364 aerial plots were analyzed for biomass estimation.

Plot size was sufficiently large to minimize between-plot variation in biomass for the number of sample plots established. The CDM Tool suggests plot sizes of at least 100-1000 m2 (depending on stand density) to adequately capture biomass variation, and subsequently reduce sample size. Aerial plot size at Rimba Raya was 10,000 m^2, so each plot is expected to be highly representative of the vegetation within its boundaries.

Plot location followed a stratified random design with all Carbon Accounting Area land cover classes represented. Plots centers are located at the center point of aerial images as recommended by the Methodology.

Stratification was performed based on available land cover mapping (e.g. Ministry of Forestry and Orangutan Foundation International) and satellite imagery (e.g. Landsat and ALOS 2008). Initial stratification included all major forest blocks and transects were located throughout these blocks to maximize sample size for ground measurements including tree DBH, crown diameter and peat depth. Final stratification was performed based on improved data and supplementary sampling (e.g. 2009 Landsat imagery and aerial image and ground reference data).

Accuracy assessment was performed on final stratification and a confusion matrix generated as required by the Methodology. An overall classification accuracy of 81.3% was obtained. The predominant class by area, lightly degraded peat swamp forest covering 30,445 ha or 33.5% of Rimba Raya, was mapped with 90.0% accuracy. A weighted kappa coefficient of 0.78 indicated there is good agreement between all map classes interpreted from satellite imagery and aerial photo data. This stratification was used in the final sample design for aerial plot locations.

AIM Step 6. For each plot, tree crown areas were digitized using standard and customized tools in ArcGIS software. Code was written to run in ARCGIS that allowed the GIS operator to click with the mouse on three

different points of the outline of each visible tree crown and the software would automatically create a circle polygon using the averaged radius from the three points.

AIM Step 7. Tree biomass was estimated using the Broadbent et al. (2008) regression equation (deviation in eq. 28 and eq. 30) using tree crown areas digitized in virtual plots. Nadir photographs or imagery cannot record all tree crowns in the plots since some crowns will be obscured from view, therefore remotely sensed biomass estimates will under-represent the true biomass present. This issue was addressed in a recent study (Broadbent, Asner, Pena-Carlos, Palace, & Soriano, 2008) that linked biomass estimates from Quickbird imagery with biomass measured in ground plots. The results showed a discrepancy between 30-50% between remotely sensed biomass estimates and ground plots. However, Broadbent et al (2008) were able to construct correction equations relating crown exposure class and the amount of obscured biomass and showed that the relationship was linear ($r2 = 0.65$, $p < 0.001$). Application of the Broadbent regression equation is expected to provide a more accurate estimation of tree biomass.

AIM Step 8. Above ground biomass was calculated per plot.

AIM Step 9. Mean biomass was calculated for each stratum by averaging across plots in a stratum (column 1 in Table 16). In order to account for possible overestimation, biomass estimates were then reduced by 28.5% to match biomass estimates from field plots (column 2 in Table 21). Biomass was converted to carbon in subsequent baseline spreadsheet calculations.

Results of tree biomass estimation are given in Table 21 below. Only in the strata classed as deforested does the sample error exceed the recommended 10% (at a 90% level of confidence). The stratum with the highest biomass has a very low sample error due to the large number of plots installed.

Table 21. Tree Biomass estimation by Strata

	Broadbent et al. 2008 Formula	**Calibrated to Ground-based Biomass Estimates**
Land Cover/Land Use Classes	**Mean (tdm/ha)**	**Mean (tdm/ha)**
Peat Swamp Forest - lightly degraded	267	**206**
Peat Swamp Forest Degraded (highly)	166	**128**
Peat Shrubland (<20% Tree Cover)	63	**49**
Kerangas Forest	112	**86**
Kerangas Open Scrub	75	**58**
Low, Sparse vegetation cover	13	**10**
Seasonally Inundated Wetlands	18	**14**

4.2.3.2 Non-tree Biomass

According to the methodology, non-tree biomass includes trees smaller than the minimum tree size measured in the tree biomass pool, and all other non-herbaceous (woody) live vegetation. At Rimba Raya, non-tree biomass is dominated by tree saplings 5-10 cm DBH. All trees of this size class were measured in 150 small plots (78.5m2) on 30 transects totalling 15 km in the carbon survey area. Biomass was calculated for each transect by applying the Chave et al. (2005) regression equation:

$$AGB = \rho \times \exp(-1.499 + 2.148 \ln D) + 0.207 (\ln D)^2 - 0.0281 (\ln D)^3)$$

Results showed that in peat swamp forest, average estimated non-tree biomass is 7,965.74 t.d.m./ha representing 3.72% of total aboveground (tree + non-tree) biomass. In transitional kerangas forest, non-tree

biomass is 6,644.88 t.d.m./ha representing 5.60% of total aboveground biomass. Based on this study, non-tree biomass contributes <0.5% to total GHG emissions (all biomass burning represents 7.1% of total GHG emissions). Given the level of effort required to carry out this intensive sampling across Rimba Raya and pursuant to guidelines in the "Tool for testing significance of GHG emissions in A/R CDM project activities" (Version 01), it was determined that non-tree biomass would be excluded from mean carbon stock assessment.

4.2.4 Estimation of GHG Emissions from changes in Aboveground Biomass

Calculations for carbon stock change in aboveground biomass are explained in full in methodology section 8.1and are 1) the sum of carbon stock changes due to timber extraction prior to land clearing, 2) biomass burning of the remaining vegetation and 3) re-growth of replacement vegetation (palm oil). Each of these components is presented below. Note that since palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations were conservatively excluded from calculations.

$$\Delta C_{B,AG,it} = E_{timber,it} + E_{B,BiomassBurn,it} - R_{B,growth,it} + E_{harvest,it} \quad (3)$$

where:

$\Delta C_{B,AG,it}$ = sum of carbon stock changes in aboveground biomass under the baseline scenario in stratum i at time t; t CO_2-e

$E_{timber,it}$ = sum of carbon stock changes in aboveground biomass due to timber extraction prior to land clearing in stratum i at time t; t CO_2-e

$E_{B,BiomassBurn,it}$ = sum of carbon stock changes in aboveground biomass due to biomass burning for stratum i at time t under the baseline scenario; t CO_2-e

$R_{B,growth,it}$ = sum of carbon stock changes in aboveground biomass due to biomass growth of living vegetation on the future land-use for stratum i at time t; t CO_2-e

$E_{harvest,it}$ = sum of carbon stock changes in aboveground biomass due to harvest activities at rotation on baseline future land-use for stratum i at time t; t CO_2-e

4.2.4.1 Emissions from timber

The biomass of timber extracted under the baseline scenario was estimated by implementing the steps outlined in section 8.1.1 in the methodology. Per applicability condition J of this methodology, in the baseline scenario the project land is assumed to be logged for timber prior to land clearing. Emissions from timber extraction are calculated as:

$$E_{timber,it} = (C_{B,it}^{extracted} - C_{B,it}^{woodproduct}) \cdot \frac{44}{12} \quad (4)$$

and

$$C_{B,it}^{extracted} = B_{B,it}^{logged} \cdot CF \cdot A_{B,it}^{logged} \quad (5)$$

$$C_{B,it}^{woodproducts} = C_{B,it}^{extracted} \cdot p \quad (6)$$

where:

$C_{B,it}^{extracted}$ = carbon stocks from trees extracted under the baseline scenario in stratum *i* at time *t*, t C

$C_{B,it}^{woodproducts}$ = carbon stocks moving into long-term wood products under the baseline scenario for stratum *i* at time *t*, t C

$B_{B,it}^{logged}$ = timber biomass logged under the baseline scenario for stratum *i* at time *t*, t d.m. ha^{-1}

CF = carbon fraction of dry matter (0.5 t C / t biomass); dimensionless

$A_{B,it}^{logged}$ = Area of land logged under the baseline scenario for stratum *i*, in time *t*, ha

p = percent of harvest industrial roundwood going into long term wood products

Estimation of area cleared and logged

The annual area of clearing was estimated to be 2,800 ha/year based on the land conversion rate assessment presented in section 4.2.2 above. This annual rate of clearing was applied to land cover types classed as forest to estimate area logged. The assumption has been made that forest conversion will happen relatively sequentially with clearing of the four concessions beginning in Years 1-4 and continuing at a rate of 2,800 ha yr-1 for a total clearing of 47,237 ha. Because there are multiple land cover types within each concession, area-weighted carbon stocks were used in the calculations.

Estimation of biomass logged

All tree species above the minimum diameter threshold were assumed to be harvested. It is conservative to assume a larger proportion of trees extracted before the remaining trees are burned, because some of the carbon in the extracted timber is stored as long-term wood products. The minimum diameter that would have been harvested under the baseline scenario was assumed to be 30 cm. This threshold is based on market survey information collected by BOSF on common practice in the region.

Biomass in the commercial component of tree species logged was estimated based on Mawas plot data. Based on measurements of 93 logging gaps in the Mawas project region, **36%** of the total aboveground biomass per tree is assumed to be extracted as timber (Table 22).

Estimation of proportion of wood products

For the purpose of estimating long-term wood products, “long-lived” is assumed to be >5 years. In the project region, the proportion of harvested wood that goes into long-term wood products was obtained using FAO (1995) data for Indonesia cited in Winjum et al. (1998)[27]:

- Table 4 of this study gives a net production of industrial roundwood (IR) of 12 Tg C in 1990.

[27] FAO 1995. FAO Yearbook: Forest products. FAO For. Serv. No. 28, FAO, Rome, 422 p

- Table 5 gives a value of 3 Tg of wood going into long-term wood products (use >5 yr; definition of long-term according to FAO definition)
- Thus, the percent of harvest logs (IR produced for all of Indonesia) going into long-term wood products is 3/12= **25%**. The remainder (short-term use <5 yr) is assumed to be oxidized in the base year.
- It was further assumed that the efficiency of milling and the proportion going into long term wood products has not changed and will not change over the next 30 years
- Wood waste generated at each stage of the conversion of timber to products was assumed to be decomposed in the year of harvest; none of the wood waste is used for cogeneration.

Wood products are therefore assumed to account for **25%** of the extracted timber (Table 22).

Timber Emissions Calculations

Table 22. Calculations of CO2 emissions from timber extraction for each land cover stratum in the Rimba Raya project boundary. An area-weighted average of all land cover types was used in the final calculations.

Substratum	Total Biomass in trees >10 cm diameter (t d.m. ha^{-1})	Biomass Extracted as Merchantable Timber >30cm (% total biomass) 36%	Carbon extracted as timber (t C ha^{-1})	Carbon Carbon Preserved as Solid Wood Products as a % yield of log 25%	Net Carbon Extracted (t C ha^{-1})	Area Weighted CO_2 emissions (t CO_2 ha^{-1})
Peat Forest (lightly degraded)	206	74.16	37.08	9.27	27.81	92.74
Peat Swamp Forest Degraded (highly)	128	46.08	23.04	5.76	17.28	4.30
Peat Shrubland (<20% Tree Cover)	49	NA	NA	NA	NA	NA
Kerangas Forest	86	30.96	15.48	3.87	11.61	0.96
Kerangas Open Scrub	58	NA	NA	NA	NA	NA
Low, sparse vegetation cover	10	NA	NA	NA	NA	NA
Seasonally Inundated Wetlands	14	NA	NA	NA	NA	NA
Open Water	0	NA	NA	NA	NA	NA

4.2.4.2 Emissions from biomass burning for land clearing

The carbon stocks remaining in the aboveground biomass pool that are left to burn after timber extraction was estimated by implementing the steps outlined in section 8.1.2 in the methodology. Per applicability condition C it is assumed in the baseline scenario that all remaining biomass that is not harvested as timber would be cleared by fire to prepare the site for new land use activity. GHG emissions from biomass burning are estimated as:

$$E_{B,BiomassBurn,it} = E_{B,BiomassBurn,CO2,it} + E_{B,BiomassBurn,N2O,it} + E_{B,BiomassBurn,CH4,it} \quad (12)$$

and

$$E_{B,BiomassBurn,CO2,it} = \left(C_{B,AC,it} \cdot PBB_{B,it} \cdot CE\right) \cdot \frac{44}{12} \quad (13)$$

The carbon extracted as timber was subtracted from total aboveground carbon stocks, and the remainder was assumed to burn (proportion burned or $PBB_{B,it}$ = 1) with a combustion efficiency of 0.5 (IPCC default) as per the methodology.

Emissions of non-CO2 gases are given by:

$$E_{B,BiomassBurn,N2O,it} = E_{B,BiomassBurn,CO2,it} \cdot \frac{12}{44} \cdot (N/Cratio) \cdot ER_{N_2O} \cdot \frac{44}{28} \cdot GWP_{N_2O} \quad (15)$$

and

$$E_{B,BiomassBurn,CH4,it} = E_{B,BiomassBurn,CO2,it} \cdot \frac{12}{44} \cdot ER_{CH_4} \cdot \frac{16}{12} \cdot GWP_{CH_4} \quad (16)$$

N/C Ratio, Emission Ratios and Global Warming Potential used default values prescribed by the methodology:

$N/Cratio$	= nitrogen-carbon ratio (IPCC default = 0.01); dimensionless
ER_{N2O}	= emission ratio for N_2O (IPCC default value = 0.007); t CO_2-e (t C)$^{-1}$
ER_{CH4}	= emission ratio for CH_4 (IPCC default value = 0.012); t CO_2-e (t C)$^{-1}$
GWP_{N2O}	= Global Warming Potential for N_2O (= 310 for the first commitment period); t CO_2-e (t N_2O)$^{-1}$
GWP_{CH4}	= Global Warming Potential for CH_4 (= 21 for the first commitment period); t CO_2-e (t CH_4)$^{-1}$

4.2.4.3 GHG removals from oil palm sequestration

In the baseline scenario, a new land use (palm oil plantation) is established after merchantable trees are harvested and the remaining biomass is cleared with fire. To remain conservative, the baseline calculations must account for the removal of Cos that occurs due to biomass growth of living trees on the future land use, as per the methodology section 8.1.3. This biomass growth is estimated as:

$$R_{B,growth,it} = R_{ARB,it} \cdot A_{it}^{planted} \cdot \frac{44}{12} \quad (40)$$

To estimate $R_{ARB,it}$,growth curves for palm oil were constructed from literature data. Equations 43-46 from the approved methodology were used to estimate the accumulation of biomass carbon on the future plantation sites. Biomass data used to formulate a non-linear growth curve are cited in Cannell (1982) but reported originally in Ng et al. (1968). In Malaysia, one or two palms of average size were sampled from each high-yielding, fertilized stand on marine clay with fine sandy loams. Stand values were obtained by multiplying mean values by the number of palms per hectare (palms ha-1 = 148 at all age classes).

Dry biomass values for stem wood and bark were combined with values for branches, fruit and foliage to compute a total aboveground biomass value. The use of these data is conservative because oil palm would likely have lower growth rates on peat soils than on high-yielding, fertilized stands on mineral soils. Equation 44 of the proposed methodology requires the use of four parameters to calibrate the non-linear growth function. The modeled growth curve and data points used to fit the curve are shown in Figure 28.

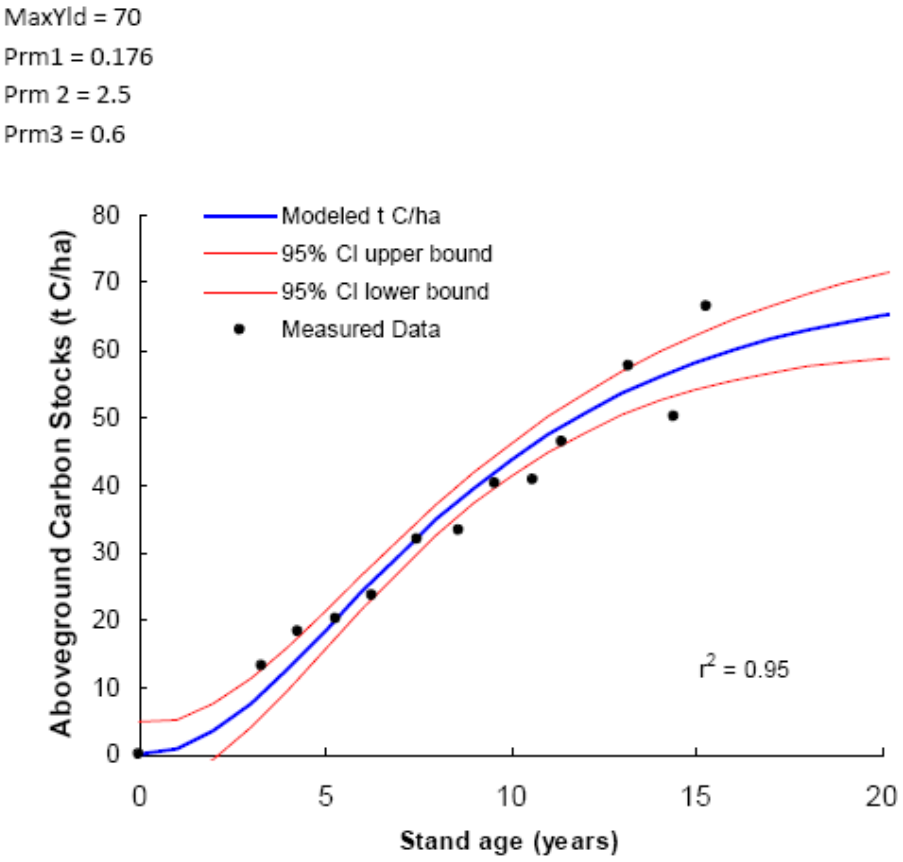


Figure 28. Modeled growth curve for oil palm (source: Ng et al. 1968).

A 90% CI was constructed for the regression model (95%CI shown in Figure 24) and used to calculate uncertainty across palm oil cohorts and years in the baseline scenario. Uncertainty is low overall in the palm oil growth parameter (<4% over the 30-year project life) but exceeds the 10% precision target in years 3-8. Baseline palm oil carbon accumulation associated with these years is low, especially compared to other carbon pools such that the project meets the allowable uncertainty under this methodology of +/- 10% CREDD, at the 90% confidence level. (methodology p.98). However, in order to build in conservativeness, estimated carbon accumulation associated with palm oil growth has been increased in years 3-8 to account for the maximum expected uncertainty.

To estimate $A^{planted}$, it is assumed that the concession areas would have been drained, cleared and burned one year prior to planting. Based on satellite image analysis of palm oil conversion rate by PT. BEST, the agent of deforestation, planting was assumed to occur at 2,800 ha yr-1, for a total of six age “cohorts” of trees across the four concessions.

4.2.5 GHG Emissions from Peat

In addition to aboveground changes in carbon stocks, baseline emissions also include emissions from peat and are estimated as:

$$E_{B,p,it} = E_{B,Drainage,it} + E_{B,PeatBurn,it} \quad (56)$$

4.2.5.1 Peat drainage

GHG emissions from peat drainage resulting from baseline land clearing are estimated as:

$$E_{B,drainage,it} = A_{B,drain,it} \cdot ME_{B,dd,it} \quad (57)$$

and:

$$ME_{B,dd,it} = f(D_{B,drain,it}) \quad (58)$$

where:

$E_{B,drainage,it}$ = CO_2 emissions from peat drainage under the baseline scenario in stratum *i* at time *t*, t CO_2-e
$A_{B,drain,it}$ = area of drainage impact under the baseline scenario in stratum *i*, time *t*, ha
$ME_{B,dd,it}$ = mean CO_2 emissions from drained peat in stratum *i*, time *t*, t CO_2 ha^{-1}
$D_{B,,drain,it}$ = average depth of peat drainage or average depth to water table under the baseline scenario in stratum *i*, time *t*, cm

Depth of peat drainage ($D_{B,drain,it}$)

To be conservative, it is assumed that areas outside the proposed plantation boundaries would be unaffected by drainage under the baseline scenario. For this analysis, it is assumed that all peat areas within the project area are undrained and that palm oil plantations maintain a constant drainage depth restricted to 100 cm below the surface (conservative value required by the methodology). This is based on data from Hooijer et al. (2006)[28] who derived a minimum estimate of 0.80 m, a likely estimate of 0.95 m and a maximum estimate of 1.1 m based on peat depths more shallow than those found in the project site.

Time dimension of peat drainage

Equation 58 from the methodology (shown above), relating CO2 emissions to drainage depth is assumed to be applicable throughout the life of the project as long as there is a peat supply available to undergo oxidation. Because peat depth in the project exceeds 1.5 meters in depth, the time dimension of peat drainage can be disregarded as per the methodology (section 8.2.1.2) since emissions from drainage would continue for more than 30 years.

Area of peat drainage($A_{B,drainage,it}$)

[28] Hooijer, A., M. Silvius, H. Wösten, S. Page. 2006. PEAT-CO2, Assessment of CO2 emissions from drained peatlands in SE Asia. Delft Hydraulics report Q3943 (2006).

It is widely recognized that forests are not homogenous and coastal Bornean peatlands may include mosaic patches of non-peat soils in close proximity to or mixed with peat. This variation in soil type is often reflected in tree species composition, such as patches of kerangas forest, which are mixed with peat swamp forest species in Rimba Raya. Therefore, to be conservative, all areas that may not meet the peat requirement based on land cover classification, were excluded from belowground biomass estimation in the baseline accounting.

Within the peat areas accounted, the annual area drained was estimated to be 2,800 ha/year based on the land conversion rate assessment presented in section 4.2.2. As per the methodology, once drained, emissions continue in subsequent years for the life of the project in the case of Rimba Raya, such that emissions are cumulative as new areas are cleared over time.

Mean CO2 emissions from drained peat ($ME_{B,dd,it}$)

Drainage depth is linked to CO2 emissions (in t CO2 ha-1 yr-1) using a regression relationship derived primarily from long-term monitoring of peat subsidence in drained peatlands combined with peat carbon content and bulk density analysis[29]. This method filters the contribution of peat compaction from the total subsidence rate, and the remainder is attributed to CO2 emission[30][31] Long-term monitoring of peat subsidence produces the most accurate and reliable data, but yields only few measurement points. For lack of a large enough population of observations, a linear relation between drainage depth and CO2 emission was fitted through the data, though the actual relation is known to be non-linear. Based on data from Couwenberg et al. (2009), mean CO2 emissions from drained peat were applied as:

$$ME_{B,DD,it} = 1.33 * D_{B,drain,it}$$

In the drainage depth range most common in southeast Asian peatlands, the relation is supported by results from numerous gas emission monitoring studies in peatlands. The mean CO2 emissions factor used in this analysis is considered conservative with ranges cited in Couwenberg et al. (2009), from 0.90 g CO2/cm to 5.0 g CO2cm.

Methane (CH4) fluxes from peat were not accounted for because research to date indicates that CH4 fluxes in tropical peatlands are negligible compared to CO2 fluxes[32].

4.2.5.2 Peat burning

After peat drainage occurs, the upper layer of peat is assumed to be intentionally burned along with aboveground biomass when the land is cleared with fire to prepare the site for new land use. GHG emissions from peat burning are estimated as:

[29] relation provided in Hooijer et al. (2006).

[30] Furukawa, Y., K. Inubushi, M. Ali, A.M. Itang, H. Tsuruta. 2005. Effect of changing groundwater levels caused by land use changes on greenhouse gas fluxes from tropical peat lands. Nutrient Cycling in Agroecosystems 71: 81-91.

[31] Hadi, A, K. Inubushi, Y. Furukawa, E. Purnorno, M. Rasmadi, H. Tsuruta. 2005. Greenhouse gas emissions from tropical peatlands of Kalimantan, Indonesia. Nutrient Cycling in Agroecosystems 71: 73-80.

[32] Jauhiainen, J., A. Jaya, T. Inoue, J. Heikkinen, P. J. Martikainen and H. Vasander. 2005. Carbon fluxes from a tropical peat swamp forest floor. Global Change Biology 11, 1788-1797.

$$E_{B,PeatBurn,it} = E_{B,PeatBurn,CO2,it} + E_{B,PeatBurn,CH4,it} \quad (60)$$

and:

$$E_{B,PeatBurn,CO2,it} = \frac{M_{B,p,it} * EF_{CO_2}}{10^6} \quad (61)$$

In accordance with the methodology, and as presented in Couwenberg et al. (2009), it was conservatively assumed that the average depth of peat burned for initial land clearing **is 0.34m**. The area of peat burned in the baseline scenario is **2,800 ha/yr** as described in the conversion rate analysis section 4.2.2.

The default value for peat bulk density **0.14 g/cm^3**was used in baseline calculations.

Note that peat bulk density was surveyed and assessed to be 0.1505 g/cm^{3}based on test results from the University of Palangkaraya survey of the project area (see Peat Survey Report). This survey was conducted for the single belowground strata defined for the project and met the uncertainty requirements of the methodology (n=48, sd = 0.0584, uncertainty = 9.234%). However, an additional survey of peat bulk density will be carried out to better represent potential variation in above-ground strata.

Emission factors for peat combustion at lower temperatures (480 °C) taken from Muraleedharan (2000) were assumed for ex ante baseline estimates as required by the methodology, as this results in lower overall GHG emissions and thus a conservative baseline. These were **185,000** g CO2 per ton of peat and **5,785** g CH4 per ton of peat[33]

4.3 Quantifying GHG emissions and/or removals for the project

4.3.1 Ex Post Actual Net GHG Emissions Avoided

GHG emissions from the baseline scenario that are not prevented within the project boundary in the project case (C_{PRJ}), such as logging, fire, or other land use changes that lead to an increase in emissions must be subtracted from the baseline scenario in annual carbon accounting. The calculations are performed annually according to the monitoring plan.

$$C_{ACTUAL} = C_{BSL} - C_{PRJ} \quad (88)$$

where:

C_{ACTUAL} = actual net greenhouse gas emissions avoided; t CO_2-e.

C_{BSL} = sum of peat emissions and carbon stock changes in aboveground biomass under the baseline scenario; t CO_2-e

C_{PRJ} = sum of emissions that occur within the project boundary ; t CO_2-

[33] Muraleedharan, T.R., M. Radojevic, A. Waugh, A. Caruana. 2000. Emissions from the combustion of peat: an experimental study. Atmospheric Environment 34: 3033-3035.

4.3.2 Market Leakage

A deduction against the biomass of timber extracted under the baseline scenario must be estimated for Market Leakage by implementing steps outlined in Section 10.1 in the methodology:

Section 10.1 of the Methodology

When REDD project activities result in reductions in wood harvest, it is likely that production could shift to other areas of the country to compensate for the reduction. Therefore, in cases where the project area would be harvested for commercial timber before clearing the site for a new land use, market effects leakage must be estimated as the baseline emissions from logging multiplied by a leakage factor:

$$LK_{MarketEffects} = \sum_{t=1}^{t^*} \sum_{i=1}^{m_{LK}} LK_{ME,it} \quad (66)$$

$$LK_{ME,it} = LF_{ME,i} * C_{B,XBT,it} \quad (67)$$

The amount of leakage is determined by where harvesting would likely be displaced to. If in the forests to which displacement would occur a lower proportion of biomass in commercial species is in merchantable material than in the project area, then more trees will need to be cut to supply the same volume and thus higher emissions should be expected. In contrast, if a higher proportion of biomass of commercial species is merchantable in the displacement forest than in the project forest, then a smaller area would need to be harvested and lower emissions would result.

Each project thus shall calculate within each stratum the proportion of total biomass in commercial species that is merchantable (*PMPi*). Merchantable biomass per stratum is conservatively defined as the total volume (converted to biomass) of all commercially valuable trees within a stratum that are above the minimum size class sold in the local timber market (see Applicability Condition J). *PMPi*is therefore equal to the merchantable biomass as a proportion of total aboveground tree biomass for stratum *I* within the project boundaries. *PMPi*shall then be compared to the mean proportion of total biomass that is merchantable for each forest type (*PMLFT*) to which displacement is likely to occur.

The following deduction factors ($LF_{ME,i}$) shall be used:

PML_{FT} is equal (±0.15) to PMP_i	$LF_{ME,i}$ =	0.4
PML_{FT} is > 0.15 less than PMP_i	$LF_{ME,i}$ =	0.7
PML_{FT} is >0.15 greater than PMP_i	$LF_{ME,i}$ =	0.2

Where:

PML_{FT}	= Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type; dimensionless
PMP_i	= Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundaries; dimensionless
$LF_{ME,i}$	= Leakage factor for stratum *i* market-effects calculations; dimensionless

Instead of applying the default market leakage discounts, project proponents may opt to estimate the project's market leakage effects across the entire country and/or use analysis(es) from other similar projects to justify a different market leakage value. A description of the market leakage assessment, including steps for determining where leakage is likely to occur (i.e., to which forest types leakage is likely to occur) and what the carbon stocks of those lands are, shall be outlined in the PDD. The outcome of this assessment conducted at

first VCU issuance (whether using default discounts or project specific analysis(es)) shall be subject to the VCS double approval process. Market leakage assessments conducted at validation stage and at verification other than the first VCU issuance are not required to undergo the double approval process.

The next step is to estimate the emissions associated with the displaced logging activity – this is based on the total volume that would have been logged in the project area in the baseline scenario. The emission due to the displaced logging has two components: the biomass carbon of the extracted timber and the biomass carbon in the forest damaged in the process of timber extraction:

$$C_{B,XBT,it} = \left(\left[V_{B,it} * \phi_i * CF\right] + \left[V_{B,it} * LDF\right]\right) * \frac{44}{12} \quad (68)$$

Where:

$C_{B,XBT,it}$	= Carbon emission due to displaced timber harvests in the baseline scenario in stratum *i* at time *t*; t CO_2-e
$V_{B,it}$	= Volume to be extracted under the baseline scenario in stratum *i* at time *t*; m^3
ϕ_i	= volume-weighted average wood density; t d.m. m^{-3} merchantable volume
CF	= carbon fraction of dry matter (0.5 t C / t biomass); dimensionless
LDF	= Logging damage factor; t C m^{-3} (default 0.37 t C m^{-3})
i	= 1, 2, 3, ..., m_{BL} baseline strata
t	= 1, 2, 3, ..., t^* years elapsed since the projected start of the REDD project activity

The total volume to be extracted under the baseline scenario in stratum *i* at time *t* (*VB,it*) can be estimated by multiplying the plot-level volume per stratum (*MVB,it* see Eq. 34) by the area cleared or logged in stratum *I* at time *t* (A cleared ,it or A logged B,it).

The logging damage factor (*LDF*) is a representation of the quantity of emissions that will ultimately arise per unit of extracted timber (m3). These emissions arise from the non-commercial portion of the felled tree (the branches and stump) and trees incidentally killed during tree felling. The default value given here comes from the slope of the regression equation between carbon damaged and volume extracted based on 534 logging gaps measured by Winrock International in Bolivia, Belize, Mexico, the Republic of Congo, Brazil, and Indonesia.

Though project proponents have made a defensible econometrics argument that neither Activity Shifting nor Market Leakage can occur with a finite non-renewable resource (peat lands) in the PD, both have been accounted for in Baseline calculations in accordance with the methodology.

In order to demonstrate the conservativeness of the methodology and these calculations, the econometrics argument against the existence of both Activity Shifting and Market Leakage is annexed herein as Annex 9.

Leakage from Market Effects was taken as a one-time deduction[34] of **-4,836,855 t CO2e**

[34] Note that the "one-time" market leakage deduction refers to this deduction being taken "up-front" since market leakage is not monitored, but over a five-year period (year 2-6) in accordance with the estimated land clearing rate.

4.4 Quantifying GHG emission reductions and removal enhancements for the GHG project

Total gross baseline emissions

Table 23 below summarizes the gross GHG emissions avoided by preventing the establishment of palm oil plantations in the project area. This summary table is broken down by component and shows that peat drainage is overwhelmingly the most significant source of GHG emissions associated with palm oil development. Under the VCS, the baseline must be reassessed after ten years. Therefore, the baseline emissions in the first ten years should be the focus of attention; estimates beyond the 10-year window are subject to change as new policy measures are instituted and new data become available.

Total Gross Baseline emissions after leakage deductions are **2,462,212 t CO_2e** in year one, **40,660,403 t CO_2e** over the first ten years and **131,107,818 t CO_2e** for the 30 year life of the project.

Table 23. Total Gross GHG emissions avoided due to project activities.

Yr of Project	Em. from timber (t CO_2e)	Em. from biomass burning (t CO_2e)	Growth of oil palm (t CO_2e)	Em. from peat burning (t CO_2e)	Em. from peat drainage (t CO_2e)	Total Gross CO2e Baseline emissions (t CO_2e)	Market Leakage Deductions (t $C0_2e$)	Total Gross Emissions after Market Leakage Deduction (t CO_2e)	Total Gross Cumulative CO2e emissions (t CO_2e)
1	558,684	557,304	0.00	764,128	582,096	2,462,212	0	2,462,212	2,462,212
2	942,209	932,655	0.00	1,269,325	1,708,385	4,852,575	(1,198,394)	3,654,181	6,116,393
3	691,873	932,655	(65,314)	1,269,325	2,785,138	5,613,677	(2,021,067)	3,592,611	9,709,003
4	62,147	749,749	(161,729)	1,018,935	3,939,956	5,609,057	(1,484,087)	4,124,970	13,833,973
5	0	517,836	(301,696)	700,845	4,578,892	5,495,876	(133,306)	5,362,569	19,196,543
6	0	222,239	(467,616)	368,692	4,915,015	5,038,330	0	5,038,330	24,234,873
7	0	0	(635,119)	0	4,915,015	4,279,896	0	4,279,896	28,514,769
8	0	0	(776,046)	0	4,915,015	4,138,969	0	4,138,969	32,653,738
9	0	0	(888,679)	0	4,915,015	4,026,336	0	4,026,336	36,680,074
10	0	0	(934,685)	0	4,915,015	3,980,330	**0**	**3,980,330**	**40,660,403**
11	0	0	(928,570)	0	4,915,015	3,986,445	0	3,986,445	44,646,849
12	0	0	(886,764)	0	4,915,015	4,028,251	0	4,028,251	48,675,099
13	0	0	(823,155)	0	4,915,015	4,091,860	0	4,091,860	52,766,959
14	0	0	(748,225)	0	4,915,015	4,166,790	0	4,166,790	56,933,749
15	0	0	(669,362)	0	4,915,015	4,245,653	0	4,245,653	61,179,402
16	0	0	(591,475)	0	4,915,015	4,323,540	0	4,323,540	65,502,941
17	0	0	(517,618)	0	4,915,015	4,397,397	0	4,397,397	69,900,338
18	0	0	(449,513)	0	4,915,015	4,465,502	0	4,465,502	74,365,840
19	0	0	(387,968)	0	4,915,015	4,527,047	0	4,527,047	78,892,887
20	0	0	(333,183)	0	4,915,015	4,581,832	0	4,581,832	83,474,719
21	0	0	(284,974)	0	4,915,015	4,630,041	0	4,630,041	88,104,760
22	0	0	(242,933)	0	4,915,015	4,672,082	0	4,672,082	92,776,842
23	0	0	(206,529)	0	4,915,015	4,708,486	0	4,708,486	97,485,328

24	0	0	(175,186)	0	4,915,015	4,739,829	0	4,739,829	102,225,157
25	0	0	(148,324)	0	4,915,015	4,766,691	0	4,766,691	106,991,848
26	0	0	(125,387)	0	4,915,015	4,789,628	0	4,789,628	111,781,476
27	0	0	(105,861)	0	4,915,015	4,809,154	0	4,809,154	116,590,630
28	0	0	(89,281)	0	4,915,015	4,825,734	0	4,825,734	121,416,364
29	0	0	(75,231)	0	4,915,015	4,839,784	0	4,839,784	126,256,148
30	0	0	(63,345)	0	4,915,015	4,851,670	0	4,851,670	**131,107,818**
Totals	**2,254,913**	**3,912,438**	**(12,083,770)**	**5,391,249**	**136,469,842**	**135,944,672**	**(4,836,855)**		

Total net baseline emissions

In accordance with the methodology, an uncertainty assessment was conducted for all parameters where required and is specified for all parameters in section 10 of this document. Typically the uncertainty confidence deduction was zero (default value used or uncertainty quantified to be <10%). In rare cases, where uncertainty could not be calculated or exceeded 10%, parameter estimates were adjusted to conservatively include this uncertainty. This built-in confidence deduction was developed by parameter so that carbon pool estimates were conservative and further confidence deductions were not warranted in calculated summary emissions.

Section 24.3 of the methodology

The allowable uncertainty under this methodology is +/- 10% of CREDD,t at the 90% confidence level. Where this precision level is met, then no deduction should result for uncertainty. Where uncertainty exceeds 10% of CREDD,t at the 90% confidence level then the deduction shall be equal to the amount that the uncertainty exceeds the allowable level.

The adjusted value for CREDD,t to account for uncertainty shall be calculated as:

$$Adjusted\_C_{REDD,t} = C_{REDD,t} * \frac{(100 \quad C_{REDD\_ERROR,t} \quad 10)}{100} \qquad (131)$$

Where:

$C_{REDD,t}$	Net anthropogenic greenhouse emission reductions at time *t*; t CO_2-e
$C_{REDD\_ERROR,t}$	Total uncertainty for REDD project activity; %
$Adjusted\_C_{REDD,t}$	Adjusted value for $C_{REDD,t}$ to account for uncertainty; t CO_2-e

Non-Permenence Risk Assessment & Deduction

Per the VCA standard, a Non-Permenence Risk Assessment has been conducted using the "***VCS_Program Update_Tool For Non-Permanence Risk Analysis And Buffer Determination_090810***" and the pertinent deduction has been made. (See Tables 3 and 4 in section 1.10 of this document)

Summary Emissions

Assessing a **20% Risk Buffer** resulted in a total deduction of **-26,221,564 t CO_2e.** The net baseline emissions are therefore calculated as **1,969,770 t CO_2e** for year one, **32,528,323 t CO_2e** for the first ten years and **104,886,254 t CO_2e** for the 30 year life of the project.

4.5 Data and parameters used in baseline calculations

Methodological pathways for baseline calculations (Figure 29) are taken from the conceptual diagram in the methodology p. 39.

There were deviations in the Aerial Image Method (AIM) steps of the baseline calculations, which are detailed in Figure 29. Briefly, equations 23, 24 and 25 reflect a deviation in tree height and crown area field measurements, neither of which was used in direct biomass estimation. Tree biomass was estimated using the Broadbent et al. (2008) regression equation (deviation in eq. 28 and 30) using tree crown areas digitized in virtual plots. This model performed better than the allometric model using site-specific data. Biomass estimates were then adjusted downward to match ground-based biomass estimates, which are lower than IPCC default values for tropical moist forest.

The deviation in AIM steps had a negligible effect on baseline calculations since methods used are consistent with prescribed methods. The method used produced lower biomass estimates than the IPCC defaults for moist tropical forest, so any effect may be considered conservative. Further, all aboveground biomass contributes <3% to total carbon stocks in Rimba Raya's peat-dominated area.

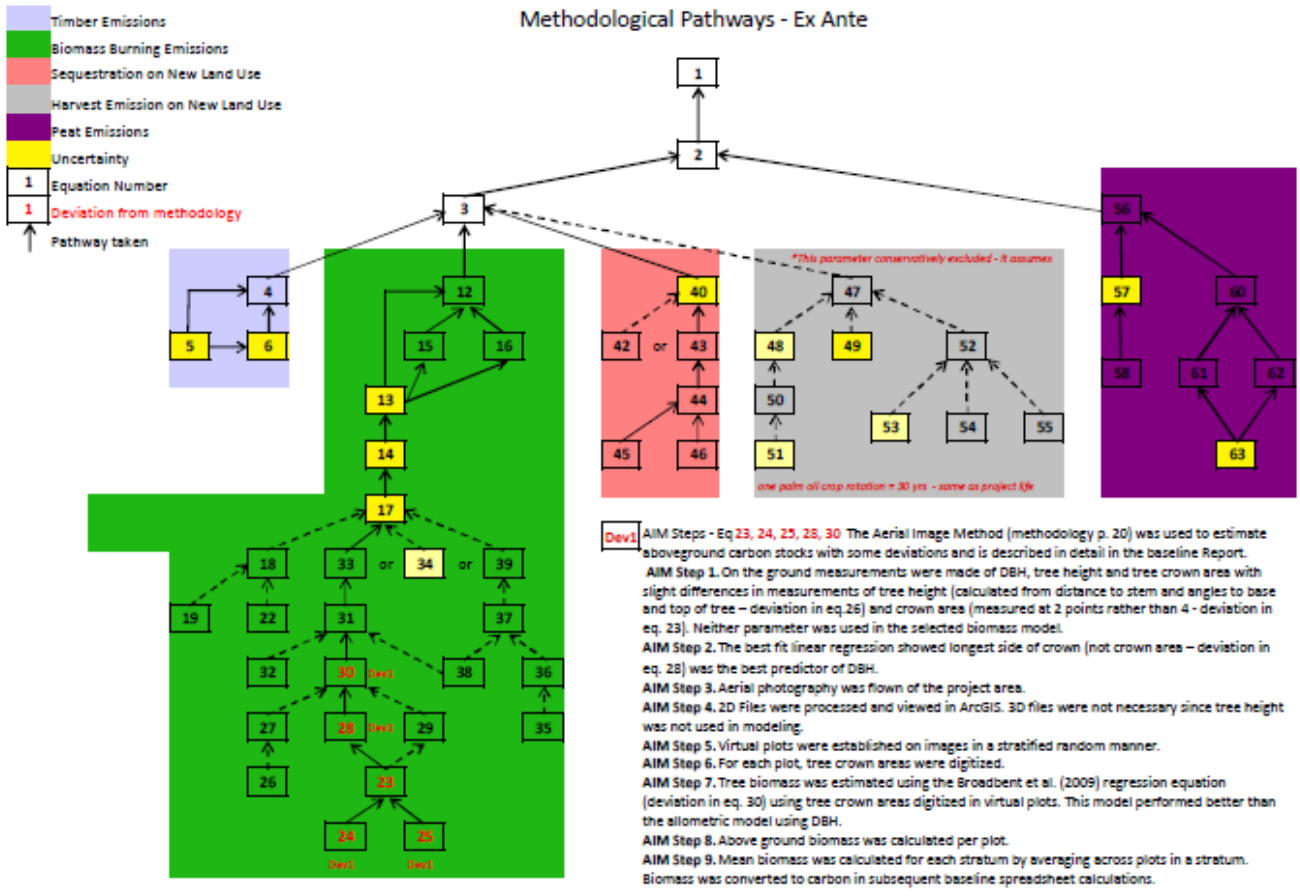


Figure 29. Conceptual diagram of baseline equations and methodological pathways used to calculate Ex-Ante GHG emissions

Specific data parameters and values used in ex ante actual net avoided GHG emissions are summarized in Table 24. These data/parameter tables expand on those in the methodology to include value used, assumptions and decisions, uncertainty estimate and deviation information.

Uncertainty estimation was conducted in accordance with the methodology and is presented in the parameter table below. Note that since this methodology is only applicable to projects where deforestation is planned and projected to occur within 10 years of the project start date (Applicability Condition D), uncertainty in **deforestation rate is assumed to be zero** (methodology p. 53). To demonstrate the most likely deforestation rate scenario, an analysis of recent palm oil conversion by the agent of deforestation was conducted. These GIS-based calculations are estimated to be > 90% accurate. GIS-based parameters for ex ante calculations fall into one of two cases, which are referenced in the parameter table:

- Case 1. Area cleared, logged or planted (2,800 ha/yr): These parameters are based on the actual rate of clearing by the deforestation agent, determined from analysis of Landsat data. Landsat is the primary tool for mapping tropical deforestation (Defries et al. 2005) and has been validated against high resolution imagery to be 92-97.5% accurate (NASA accessed January 15, 2011 http://www.glcf.umd.edu/data/paraguay/description.shtml).

- Case 2. Area drained: Drainage area is based on stratification of peat/non-peat which derives from landcover stratification where non-peat types (Kerangas Forest and Open Kerangas Scrub) were differentiated from all other types with 92% producer's accuracy and 98.5% user's accuracy.

Table 24. Data/Parameters Needed for Estimation of Ex Ante GHG Emissions

Data/parameter 1:	CF
Data unit:	Dimensionless
Used in equations:	5, 30, 34, 36, 67
Description:	Carbon fraction of dry matter
Source of data and reference:	IPCC default value = 0.50
Measurement procedures: (if any)	n/a
Value used:	0.50
Comment:	used in multiple spreadsheets in biomass => carbon calculations
Assumptions and Decisions:	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 2:	$A_{B,it}^{logged}$
Data unit:	Ha
Used in equations:	5
Description:	Area of land logged under the baseline scenario for stratum i, in time t
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	n/a
Value used:	Rate 2,800 ha/yr (stratum i, time t)
Comment:	Used in Timber Extraction spreadsheet
Assumptions and Decisions	The area logged was assumed to be the area cleared

	in all landcover types classified as forest. The expected annual rate of conversion was determined by analyzing historical rate of conversion by the baseline agent.
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 3:	P
Data unit:	Dimensionless
Used in equations:	6, 49
Description:	percent of harvest industrial roundwood going into long term wood products
Source of data and reference:	Industry standard value: FAO 1995. FAO Yearbook: Forest products. FAO For. Serv. No. 28, FAO, Rome, 422 p.
Measurement procedures: (if any)	n/a
Value used:	0.25
Comment:	Used in Timber Extraction spreadsheet
Assumptions and Decisions	In the project region, the proportion of harvested wood that goes into long-term wood products was obtained using FAO data for Indonesia cited in Winjum et al. (1998)
Uncertainty estimate:	Required. Zero. Conservative Value. Industry standard dataset (FAO 1995) and report (Winjum et al. (1998) calculated with 90% Confidence Interval.
Deviation from Methodology:	None

Data/parameter 4:	*AP*
Data unit:	m^2
Used in equations:	32, 38
Description:	Plot Area
Source of data and reference:	Aerial plot measurement
Measurement procedures: (if any)	Digitized on aerial photographs using GIS measure tool
Value used:	10,000
Comment:	parameter created but not used
Assumptions and Decisions	eq 38 not used since allometric method not selected as allowed by the methodology p. 20; eq 32 not used because different AIM Step calculations were made.
Uncertainty estimate:	Not required.
Deviation from Methodology:	Deviation AIM Steps

Data/parameter 5:	*BEF*
Data unit:	Dimensionless
Used in equations:	8, 34
Description:	Biomass expansion factor for conversion of biomass of merchantable volume to above-ground biomass
Source of data and reference:	Literature Values
Measurement procedures: (if any)	n/a

Value used:	
Comment:	Parameter not used
Assumptions and Decisions	eq 34 not used (since BEF method not selected as allowed by the methodology p. 20; eq 8 not used because different AIM Step calculations were made.
Uncertainty estimate:	n/a
Deviation from Methodology:	Deviation AIM Steps

Data/parameter 6:	Φ
Data unit:	g cm^3
Used in equations:	8, 34, 51, 68
Description:	Volume-weighted average wood density
Source of data and reference:	Literature Value: Reyes, Brown, Chapman and Lugo (1992) mean wood density for tropical Asia represented by 428 species, SE = 0.007
Measurement procedures: (if any)	n/a
Value used:	0.57 (SD = 0.145)
Comment:	Used in Biomass Burning Spreadsheet
Assumptions and Decisions	eq 68 used for leakage calculation; eq 34 not used (since BEF method not selected as allowed by the methodology p. 20; eq 8 not used because different AIM Step calculations were made.
Uncertainty estimate:	90% CI/mean* 100 = 2.03%
Deviation from Methodology:	None

Data/parameter 7:	$PBB_{B,it}$
Data unit:	Dimensionless
Used in equations:	13
Description:	average proportion of *CB,AC,it* burnt under the baseline scenario in stratum *i*, time *t*
Source of data and reference:	methodology p. 16
Measurement procedures: (if any)	n/a
Value used:	1
Comment:	Used in Biomass Burning -BL E51
Assumptions and Decisions	As per the methodology p. 16 “because the land is being cleared for another land use in the baseline scenario, all of the biomass that is not extracted as timber is assumed to be burned and therefore this methodology the proportion burned in the baseline $PBB_{B,it}$ is assumed to be equal to 1.”
Uncertainty estimate:	n/a
Deviation from Methodology:	none

Data/parameter 8:	*CE*
Data unit:	Dimensionless
Used in equations:	13, 53
Description:	Average biomass combustion efficiency
Source of data and reference:	IPCC default =0.50
Measurement procedures: (if any)	n/a

Value used:	0.50
Comment:	Used in Biomass Burning spreadsheet
Assumptions and Decisions	
Uncertainty estimate:	Required. Zero. Default value used.
Deviation from methodology:	None.

Data/parameter 9:	$A_{cleared\ B\ it}$
Data unit:	Ha
Used in equations:	14, 72, 74, 76
Description:	Area cleared under the baseline scenario for stratum *i,* in time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	GIS overlay analysis
Value used:	Rate 2,800 ha/yr (stratum i, time t)
Comment:	Used in Timber Extraction spreadsheet
Assumptions and Decisions	The expected annual rate of conversion was determined by analyzing historical rate of conversion by the baseline agent.
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 10:	*N/C ratio*
Data unit:	Dimensionless
Used in equations:	15, 54
Description:	Nitrogen-carbon ratio
Source of data and reference:	IPCC default =0.01
Measurement procedures: (if any)	n/a
Value used:	0.01
Comment:	used in Biomass Burning spreadsheet
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 11:	ER_{N2O}
Data unit:	t CO2-e (t C)-1
Used in equations:	16, 55
Description:	Emission ratio for N2O
Source of data and reference:	IPCC default value =0.007
Measurement procedures: (if any)	n/a
Value used:	0.007
Comment:	see Biomass Burning spreadsheet
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 12:	ER_{CH4}
Data unit:	t CO2-e (t C)-1
Used in equations:	16, 55
Description:	Emission ratio for CH4
Source of data and reference:	IPCC default value = 0.012
Measurement procedures: (if any)	n/a
Value used:	0.012
Comment:	see Biomass Burning spreadsheet
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 13:	$GWP_{N\,2O}$
Data unit:	t CO2-e (t N2O)-1
Used in equations:	15, 54
Description:	Global Warming Potential for N2O
Source of data and reference:	Methodology =310 for the first commitment period
Measurement procedures: (if any)	n/a
Value used:	310
Comment:	see Biomass Burning spreadsheet
Assumptions and Decisions	Used in eq 15. Eq 54 not calculated – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations were not considered in baseline estimation. This is conservative.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 14:	GWP_{CH4}
Data unit:	t CO2-e (t CH4)-1
Used in equations:	16, 55
Description:	Global Warming Potential for CH4
Source of data and reference:	Methodology =21 for the first commitment period
Measurement procedures: (if any)	n/a
Value used:	21
Any comment:	see Biomass Burning spreadsheet
Assumptions and Decisions	Used in eq 16. Eq 55 not calculated – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations were not considered in baseline estimation. This is conservative.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 15:	$A_{sampleframe}$
Data unit:	m^2
Used in equations:	20
Description:	Area of one sampling frame
Source of data and reference:	Field Measurement

Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 16:	*CFnon-tree*
Data unit:	Dimensionless
Used in equations:	19
Description:	Carbon fraction of dominant non-tree vegetation species
Source of data and reference:	Field measurement or literature values
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 17:	*MCAG,nontree_sample,sf,,it*
Data unit:	Kg. d.m.
Used in equations:	19
Description:	Carbon stock in above ground non-tree vegetation in sample plot *sf* in stratum *i* at time *t* from sampling frame method
Source of data and reference:	Field measurement.
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 18:	*CFq*
Data unit:	t C t-1 d.m.
Used in equations:	21
Description:	Carbon fraction of biomass for species q
Source of data and reference:	Field measurement or literature values
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used

Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 19:	*fq(vegetation parameters)*
Data unit:	t. d.m. individual-1
Used in equations:	21
Description:	Allometric equation for species *q* linking parameters such as stem count, diameter of crown, height, or others to above-ground biomass of an individual
Source of data and reference:	Field measurement or literature values
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 20:	Ar_i
Data unit:	Ha.
Used in equations:	22
Description:	Total area of all non-tree allometric method sample plots in stratum *i*
Source of data and reference:	Field Measurement
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 21:	$MC_{AG\_nontree\_allometric,i,r,t}$
Data unit:	t C
Used in equations:	22
Description:	Aboveground biomass carbon stock in nontree vegetation in sample plot *r* of stratum *i* at time *t* from non-tree allometric sample plots
Source of data and reference:	Field measurement.
Measurement procedures: (if any)	n/a
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	non-tree biomass accounts for < 0.5% of total GHG emissions and was conservatively excluded from

	biomass estimation.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None.

Data/parameter 22:	*angle*
Data unit:	Degrees
Used in equations:	24, 25, 26
Description:	angle formed between observer's eye and end of farthest observable canopy branch facing each of eight compass directions or one of two vantage points (24, 25). Angle formed between observer's eye and top of tree (26)
Source of data and reference:	Field Measurement.
Measurement procedures: (if any)	Clinometer used to position observer directly below canopy edge (angle = 90 and cos angle = 1) for crown dimension measurement (see Field SOP) (similar to 24, 25) and to top and bottom of tree (similar to 26)
Value used:	See Carbon Survey Report data
Comment:	Parameter not used
Assumptions and Decisions	tree height tested but not used in allometric equation as allowed by the methodology AIM Step 2
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 23:	*Dist*
Data unit:	Cm
Used in equations:	24, 25
Description:	distance from observer to end of first canopy branch facing each of eight compass directions or from one of two vantage points
Source of data and reference:	Field Measurement.
Measurement procedures: (if any)	Laser distance measurer used to measure tree distance from single vantage point to the tree stem (see Field SOP)
Value used:	See Carbon Survey Report data
Comment:	Parameter not used
Assumptions and Decisions	tree height tested but not used in allometric equation as allowed by the methodology AIM Step 2
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 24:	*Dbh*
Data unit:	Cm
Used in equations:	24, 25
Description:	diameter at breast height of tree
Source of data and reference:	Field Measurement.
Measurement procedures: (if any)	measured using DBH tape and standard forest survey procedures (see Field SOP)

Value used:	See Carbon Survey Report data
Comment:	
Assumptions and Decisions	Not used in eq 24,25. DBH was used in allometric equation by Chave et al. (2005) to estimate aboveground biomass from survey plots to test/validate biomass estimation equations.
Uncertainty estimate:	Not required.
Deviation from Methodology:	Deviation AIM Step 1.

Data/parameter 25:	H_{eye}
Data unit:	Meters
Used in equations:	26
Description:	height from ground to observer's eye
Source of data and reference:	Field Measurement.
Measurement procedures: (if any)	Clinometer used to measure angle to top and bottom of tree rather than H_{eye} (see Field SOP)
Value used:	See Carbon Survey Report data
Comment:	Parameter not used
Assumptions and Decisions	Note: tree height tested but not used in allometric equation as allowed by the methodology AIM Step 2
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 26:	H_{tree}
Data unit:	Meters
Used in equations:	26, 27, 29
Description:	height of tree
Source of data and reference:	Calculation from field data.
Measurement procedures: (if any)	n/a
Value used:	See Carbon Survey Report data
Comment:	Parameter not used
Assumptions and Decisions	Note: tree height tested but not used in allometric equation as allowed by the methodology AIM Step 2
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 27:	$MV_{B,AG\_timber,it}$
Data unit:	m3 ha-1
Used in equations:	34, 76
Description:	Mean merchantable volume under the baseline scenario in stratum i at time *t*
Source of data and reference:	Field Measurement.
Measurement procedures: (if any)	
Value used:	n/a
Comment:	Parameter not used
Assumptions and Decisions	eq 34 not used since BEF method not selected as allowed by the methodology p. 20; Parameter B_{logged} used in place of $MV_{B,AG\_tree,it}$ in eq 76 leakage
Uncertainty estimate:	n/a

Deviation from Methodology:	None

Data/parameter 28:	$A_{it}^{planted}$
Data unit:	Ha
Used in equations:	40
Description:	area of biomass growth on future land use in the baseline scenario in stratum *i* at time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	GIS analysis
Value used:	Rate 2,800 ha/yr
Comment:	Based on historical rate of plantation conversion by the baseline agent. See discussion Baseline Report. For values see oil palm regrowth worksheet. Annual area of planting cohorts A-F shown in columns E, I, M, Q, U, Y.
Assumptions and Decisions	Strata based on concession boundaries. Time based on staggered concession development and planting north to south.
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 29:	*Slp*
Data unit:	t C ha-1 yr-1
Used in equations:	42
Description:	slope of regression line of biomass accumulation function
Source of data and reference:	Calculated based on field measurements
Measurement procedures: (if any)	
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	Non-linear function used to fit data on palm oil growth, therefore Slp parameter and eq 42 not used as allowed by the methodology p.28
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 30:	*B*
Data unit:	t C ha-1
Used in equations:	41
Description:	intercept of regression line
Source of data and reference:	Calculated based on field measurements
Measurement procedures: (if any)	
Comment:	
Value used:	Parameter not used
Assumptions and Decisions	Non-linear function used to fit data on palm oil growth, therefore Slp parameter and eq 42 not used

	as allowed by the methodology p.28
Uncertainty estimate:	Not required
Deviation from Methodology:	None

Data/parameter 31:	age_{peak}
Data unit:	Years
Used in equations:	45
Description:	age of stand at peak production
Source of data and reference:	literature values : Data reported in Cannell M.G. R. 1982. World Forest Biomass and Primary Production Data. Academic Press. London. 391 pp.
Measurement procedures: (if any)	n/a
Value used:	14
Comment:	See discussion Baseline Report Oil Palm Growth Model Data
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 32:	$A^{cleared}_{BH\ it}$
Data unit:	Ha
Used in equations:	48, 53
Description:	Area cleared at harvest *H* under the baseline scenario for stratum *i*, in time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	
Value used:	Parameter not used
Comment:	
Assumptions and Decisions	Eq 48 not calculated – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations $E_{harvest}$ were not considered in baseline estimation. This is conservative.
Uncertainty estimate:	n/a
Deviation from Methodology:	None

Data/parameter 33:	*PBH*
Data unit:	Dimensionless
Used in equations:	48
Description:	average proportion of aboveground carbon stock removed during harvest *H* under the baseline scenario for stratum *i*, time t
Source of data and reference:	Field measurements or literature data
Measurement procedures: (if any)	
Value used:	Parameter not used
Comment:	

Assumptions and Decisions	Eq 48 not calculated – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations $E_{harvest}$ were not considered in baseline estimation. This is conservative.
Uncertainty estimate:	n/a
Deviation from Methodology:	None

Data/parameter 34:	$PBB_{BH,it}$
Data unit:	Dimensionless
Used in equations:	53
Description:	average proportion of remaining aboveground carbon stocks burnt at harvest H under the baseline scenario in stratum *i*, time *t*
Source of data and reference:	
Measurement procedures: (if any)	
Value used:	
Comment:	Parameter not used
Assumptions and Decisions	Eq 48 not calculated – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations $E_{harvest}$ were not considered in baseline estimation. This is conservative.
Uncertainty estimate:	n/a
Deviation from Methodology:	None

Data/parameter 35:	$D_{B,,drain,it}$
Data unit:	Cm
Used in equations:	58
Description:	average depth of peat drainage or average depth to water table under the baseline scenario in stratum *i*, time *t*
Source of data and reference:	Methodology default value = 100 cm
Measurement procedures: (if any)	
Value used:	100
Comment:	See Peat Drainage spreadsheet
Assumptions and Decisions	Note that peat depth across the project area is greater than the peat depth lost via subsidence and burning in the baseline scenario over the project life, therefore the net peat drainage depth of no more than 1 meter is used - Condition F of the methodology.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 36:	$A_{B,drain,it}$
Data unit:	Ha
Used in equations:	57
Description:	area of drainage impact under the baseline scenario in stratum *i*, time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records

	and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	
Value used:	See Peat Drainage spreadsheet
Comment:	
Assumptions and Decisions	Strata comprised of concession boundaries and land cover (all types except kerangas forest and kerangas scrub which overlay sandy soil). Note peat drainage emissions are cumulative, expanding to cover the full extent of concessions, then continuing over the life of the project.
Uncertainty estimate:	Required. Zero. Case 2 described above.
Deviation from Methodology:	None

Data/parameter 37:	D_{peat}
Data unit:	Meters
Used in equations:	59
Description:	average depth of peat in project area
Source of data and reference:	Field Measurements
Measurement procedures: (if any)	Measured using peat probe at 159 sample points on 8 transects across project site (see Field SOP).
Value used:	4.3
Comment:	See Carbon Survey Report
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 38:	$D_{B,burn,it}$
Data unit:	cm
Used in equations:	63
Description:	depth of peat burned under the baseline scenario in stratum *i* at time *t*;
Source of data and reference:	Literature value: Couwenberg et al. (2009) cited in the methodology p. 36
Measurement procedures: (if any)	
Value used:	34cm
Comment:	
Assumptions and Decisions	According to the methodology p. 37 “The depth of peat burned shall be assumed to be equal to the drainage depth, minus a critical threshold of 40 cm above the drainage depth. If the difference between drainage depth and the critical threshold exceeds 34 cm, then the maximum burn depth of 34 cm shall be applied.” Since drainage depth for the baseline is 100cm, a burn depth of 34 cm is used.
Uncertainty estimate:	Required. Zero. Default value used.
Deviation from Methodology:	None

Data/parameter 39:	$A_{B,burn,it}$
Data unit:	Ha
Used in equations:	63
Description:	area of peat burned under the baseline scenario in stratum *i* at time *t*;
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	
Value used:	See Peat Burning spreadsheet
Comment:	
Assumptions and Decisions	Strata comprised of concession boundaries and land cover (all types except kerangas forest and kerangas scrub which overlay sandy soil). Note burning is a one-time event occurring during years 1-8 of staggered concession development. Estimated rate of burning = rate of deforestation and clearing.
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 40:	BD_i
Data unit:	g cm-3 = t m-3
Used in equations:	63
Description:	Bulk density of peat in stratum I (g cm3 = t m3)
Source of data and reference:	Default value
Measurement procedures: (if any)	
Value used:	0.14
Comment:	see Peat Burning spreadsheet
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 41:	EF_{CO2}
Data unit:	g CO2 (t peat)-1
Used in equations:	61
Description:	CO2 emissions from the combustion of peat
Source of data and reference:	Literature value. Muraleedharan et al. (2000) cited in the methodology p. 38
Measurement procedures: (if any)	
Value used:	185,000
Comment:	Peat Burning spreadsheet
Assumptions and Decisions	As per the methodology, the emission factors for peat combustion at the lower temperatures were assumed in the ex ante baseline estimates, as this results in lower overall GHG emissions (CO2 + CH4 reported as CO2 equivalents) and thus a conservative baseline scenario.
Uncertainty estimate:	Not required.

Deviation from Methodology:	None

Data/parameter 42:	EF_{CH4}
Data unit:	g CH4 (t peat)-1
Used in equations:	62
Description:	CH4 emissions from the combustion of peat
Source of data and reference:	Literature value
Measurement procedures: (if any)	
Value used:	5,785 g/ton peat
Comment:	Peat Burning – BL worksheet cell E6
Assumptions and Decisions	As per the methodology, the emission factors for peat combustion at the lower temperatures were assumed in the ex ante baseline estimates, as this results in lower overall GHG emissions (CO2 + CH4 reported as CO2 equivalents) and thus a conservative baseline scenario.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 43:	*LDF*
Data unit:	t C m-3
Used in equations:	68
Description:	Logging Damage Factor for calculating the biomass of dead wood created during logging operations per cubic meter extracted
Source of data and reference:	Default value of 0.37 t C m-3 from 534 logging gaps measured by Winrock International in Bolivia, Belize, Mexico, the Republic of Congo, Brazil and Indonesia may be used for tropical broadleaf forests.
Measurement procedures: (if any)	
Value used:	0.37
Comment:	
Assumptions and Decisions	
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 44:	PML_{FT}
Data unit:	%
Used in equations:	Unnumbered eq methodology page 41
Description:	Mean merchantable biomass as a proportion of total aboveground tree biomass for each forest type to which displacement of logging activities is likely to occur.
Source of data and reference:	GIS data from landcover/forest maps published by Ministry of Forestry. All forest types in which commercial logging could take place within PT Best concessions were considered.
Measurement procedures: (if any)	
Value used:	< 0.20

Comment:	
Assumptions and Decisions:	There is minimal remaining forest in PT BEST concessions outside Rimba Raya, therefore a relative value of < 0.20 was sufficient for determining that PML_{FT} is > 0.15 less than PMP_i (methodology p. 41) and therefore the highest market leakage deduction factor is selected and applied. This results in the most conservative (largest) deduction from the baseline estimate for market leakage as a result of Rimba Raya's comparatively high timber volume being removed from PT BEST concession's timber potential.
Uncertainty estimate:	n/a
Deviation from Methodology:	None

Data/parameter 45:	$V_{B,it}$
Data unit:	m^3
Used in equations:	68
Description:	Volume of timber projected to be extracted from within the project boundary during the baseline in stratum *i* at time *t*
Source of data and reference:	Source of data same as biomass logged parameter.
Measurement procedures: (if any)	
Value used:	Embedded in equation 68, see biomass burning spreadsheet
Comment:	Note that this volume does not include logging slash left onsite. Extracted volumes reported are gross volumes removed.
Assumptions and Decisions:	Biomass logged was already derived for RR based on Mawas field data and is the same as the first term of the CB,XBT,it equation. By setting this term equal to Biomass logged, V B, it is derived and used directly in eq. 68.
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 46:	PMP_i
Data unit:	%
Used in equations:	Unnumbered eq. p. 41
Description:	Merchantable biomass as a proportion of total aboveground tree biomass for stratum *i* within the project boundaries
Source of data and reference:	unpublished data from Mawas, Winrock 2008
Measurement procedures: (if any)	
Value used:	Mean 0.36, SD 0.169
Comment:	Same as B logged (Biomass Extracted as Merchantable Timber >30cm in Timber Extraction spreadsheet)
Assumptions and Decisions:	Mawas data provides complete dataset applicable to

	Rimba Raya project site. Average proportion of merchantable timber across 93 logging gaps
Uncertainty estimate:	Not required.
Deviation from Methodology:	None

Data/parameter 47:	$HistHa_i$
Data unit:	Ha
Used in equations:	72
Description:	Average annual area of deforestation by the baseline agent of the planned deforestation in stratum *i* for the 5-10 years prior to project implementation
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	GIS analysis
Value used:	6113.7
Comment:	See discussion Baseline Report
Assumptions and Decisions:	
Uncertainty estimate:	Required. Zero. Case 1 described above.
Deviation from Methodology:	None

Data/parameter 48:	$A_{defLK,it}$
Data unit:	Ha
Used in equations:	73
Description:	The total area of deforestation by the baseline agent of the planned deforestation in stratum *i* at time *t*
Source of data and reference:	Analysis of remote sensing data and/or legal records and/or survey information for lands owned or controlled or previously owned or controlled by the baseline agent of deforestation
Measurement procedures: (if any)	GIS analysis of satellite imagery
Value used:	Not calculated as of year 1 (no leakage)
Comment:	Legal records will include government permits to deforest including concession licenses. Ex-ante, project proponents shall determine and justify the likelihood of leakage based on characteristics of the baseline agent. To be calculated if activity shifting leakage is detected. See Monitoring plan discussion.
Assumptions and Decisions	
Uncertainty estimate:	N/A year 1
Deviation from Methodology:	None

5. Environmental Impact

An Environmental Impact Assessment was conducted by independent consultants in March, 2010 the conclusions of which can be reviewed in Annex 10. Since the main goal of the Rimba Raya project is to conserve a large tract of peat forest, the impacts of the project will be mostly positive from an environmental perspective. It is expected that regional biodiversity levels will be maintained and species populations will increase as important natural habitat is preserved. From a hydrology perspective, conservation of the peat forest will maintain the proper functionality of the local watershed. Nutrient flows from fallen biomass will serve as a critical food source for fish and other marine life. Tree cover will lower water temperature through shading making it a more conducive marine habitat. Vegetative cover will also mitigate erosion and flooding associated with land conversion by decreasing runoff and increasing soil absorption, thereby leading to improved water quality.

Despite the enormous positive environmental impacts of the project, activities associated with the promotion of eco-tourism in surrounding communities (planned after year three) and fire suppression could potentially create minor negative environmental impacts:

- An increase in tourists could reduce water quality if waste is not properly managed.
- Use of motorized tourist transport vehicles in local waterways could increase water pollution.
- Population increases due to economic opportunities of the project (tourism, reserve employees) could increase stress on the forest for basic needs.
- The construction of fire access roads in and around the Carbon Accounting Area may disturb natural habitat and also cause soil compaction.
- The construction of fire patrol towers could potentially disturb natural habitat although they will likely be constructed in previously degraded areas.
- The use of water for firefighting activities may further reduce water levels during periods of drought.

The Rimba Raya project will reduce the potential of these risks by working with local communities to create a tourism development plan that deals with the potential problems cause by the emergence of this sector. In terms of fire suppression, fire access roads will use existing logging rail and trail infrastructure and a water management plan has already been incorporated into the projects comprehensive fire plan. Ultimately the environmental benefits of created by this project outweigh any negative impacts created.

6. Stakeholders' Comments

Despite the absence of communities or families living within the boundaries of the Carbon Accounting Area, the Rimba Raya Reserve project has, through a series of formalized meetings, gained local approval of the project by including communities bordering the buffer zone of the Carbon Accounting Area as stakeholders in the project development process. These meetings and community approvals are summarized in Table 25 and documented in Annex 11. InfiniteEARTH views local stakeholder participation as the key to the project's success in terms of preventing illegal logging and fires.

In order to engage local communities, the project proponent has consummated a partnership agreement with World Education, a well-known development organization that has been working with communities in the area since 2003 on a project funded by USAID. This organization in conjunction with Daemeter Consulting conducted an initial baseline survey to assess community development needs, local uses of the

surrounding forests, and community land use. A large population of community members in the Project Zone was interviewed. A summary of some of the more formal dialogues is presented below.

Survey findings related to development needs have been incorporated into the development strategy of the Rimba Raya project so that program goals match local needs. In terms of local land use in the buffer zone, it was found that local communities were highly dependent on the waterways for transport and also fishing. Community members consistently mentioned access to clean river water as an important priority and voiced their concern about the potential threat of their rivers becoming polluted with sediment and chemicals if oil palm plantations expanded in the area. Non-timber forest products were also collected for local use and these rights will be respected by the project as they promote the sustainable use of the forest. In terms of community land use, farmers use land that lies to the east of the Seruyan River, which is outside the Carbon Accounting Area and borders the Project Zone. However, there are a few exceptional cases where farmers are cultivating small plots in the Project Zone. These land rights have been recognized by the project in order to avoid local conflict, although none of these conflicts with the Carbon Accounting Area.

InfiniteEARTH has also developed a strategic partnership with the renowned conservation organization Orangutan Foundation International, which has a major role in managing the neighboring Tanjung Puting National Park. This strong relationship has allowed InfiniteEARTH to benefit from the many years of experience OFI has in managing a large-scale conservation projects and securing community support for this type of project.

In terms of engaging the Indonesian government, InfiniteEARTH has created partnerships with the government at all levels including the village, district, and provincial level. At the village level, approval from village heads has been obtained in the form of letters encouraging the further development of the Rimba Raya Reserve. The district head along with the governor have both formally approved the project and recommended it to the Ministry of Forestry. At the national level, the project has engaged the local BKSDA (forest conservation) section of the Ministry of Forestry on developing an effective fire management plan. The project proponent has taken the approach of extensive collaboration and communication with government bodies to avoid confusion and create a more transparent process for all involved parties as this will ultimately lead to a successful project implementation.

Table 25. Overview of Stakeholder Meetings during Project Development

Date	Name(Village or Organization)	Purpose of Meeting	Conducted by
• December 23-26 2008	14 Villages	Initial Community Survey	Daemeter
• October 16 2009 • November	Tanjung Hanau	1. Developing agriculture, especially for woman group with 14 women 2. Zero-burning agriculture development (rice field demonstration plot)	World Education
• December 8, 2009 • October 13 2009 • November 2009	Ulak Batu	1. Planning to develop a community forest (Jelutung and Gaharu plantation) with 11 communities 2. Developing agriculture, especially for woman group with 16 women 3. Community fisheries development	World Education

• December 10 2009 • November 15 2009 • November 2009 • November 20, 2009 • October 2009 and November 2009	Baung	1. Planning to develop a community forest (Jelutung and Gaharu plantation) with: a. village head and 4 community members b. 15 communities members a joint survey was conducted c. 5 communities to determined the site of jelutung forest demo-plot 2. Community fisheries development 3. Zero-burning agriculture development (rice field demonstration plot) with 11 communities 4. Forest protection, where a joint survey was conducted on determine the cause of previous forest fires	World Education
• 2009.12.8-10	Tanjung Rengas	Planning to develop community forest (Jelutung and Gaharu plantation) with 7 communities	World Education
• 2009.12.22 • 2008.11. 16 • 2009.10.10 and 2009.11.12	Muara Dua	1. Planning to develop community forest (Jelutung and Gaharu plantation) With 2 communities 2. Community fisheries development With 11 communities 3. Forest protection, where a joint survey was conducted on determine the cause of previous forest fires	World Education

• 2000.11.6-11	Bahaur, Tanjung Rengas, Baung, Paren, Parang Batang, Tanjung Hanau, Paring Raya	Supporting Letter from Villages	RRC, WE
• 2010.01.13-14	World Education, Tanjung Puting National Park and OFI	Discussion about Rimba Raya plan of activities and sharing information with Stakeholder	RRC
• 2010.01.15-19	3 villages Ulak Batu, Baung, Muara Dua	Village visit to share more about PT RRC	RRC
• 2010.02.07-08	Agriculture Department Seruyan District Department of Forestry and Plantation Seruyan District	Additional talks about Rimba Raya to government agency	RRC
• 2010.02.09-10	Seruyan Government, 5 Villages (Muara Dua, Baung, Palingkau, Ulak Batu and Tanjung Hanau	Stake Holder Meeting	World Education
• 2010.02.26-28	3 villages (Bahaur, Telaga Pulang, Muara Dua)	Focus Discussion Group (FGD) regarding socialization of Rimba Raya	RRC, PT Focus

• 2010.02.25 – 2010.03.01	Hanau sub-district, Danau Sembuluh sub-district, and Seruyan Hilir sub-district	Preparation forum of socialization and to make sure location of the meeting and scheduling	RRC
• 2010.03.08-11	14 villages in 3 sub districts (Seruyan Hilir sub-district, Danau Sembuluh sub-district and Hanau sub-district)	Socialization of Rimba Raya Conservation on three sub-district (Seruyan Hilir, Danau Sembuluh and Hanau)	RRC, PT Focus
• 2010.03.22-23	Forestry agency district level Head of Seruyan Hilir sub-district, Environment agency (Badan Lingkungan Hidup) District level	Distribution of UKL UPL Document	RRC
• 2010.03.28-30	Forestry agency district level, Province level, Environment agency District level, Province Level	Presentation UKL UPL PT. Rimba Raya Conservation, held on BLH Province level at Palangkaraya.	RRC, PT Focus
• 2010.05.17-19	5 villages (Baung, Muara Dua, Jahitan, Tanjung Rengas, Telaga Pulang)	Mini Solar Light Assistance program	RRC
• 2010.06.18-19	4 villages (Bahaur, Palingkau, Ulak Batu, Cempaka Baru)	Mini Solar Light Assistance program	RRC
• 2010.06.26-27	5 villages (Parang Batang, Paring Raya, Tanjung Hanau, Banua Usang, Paren)	Mini Solar Light Assistance program	RRC
• 2010.07.12-13	4 villages (Tanjung Rengas, Muara Dua, Jahitan, Baung)	Fire Training	BKSDA and RRC
• 2010.05.1-30	14 villages	Initial Public Comment Period Field-activities	RRC and World Education
• 2010.09.1-30	14 villages	Formal CCB Public Comment Period Field-activities	RRC and World Education

Changes to Project resulting from stakeholder consultations

Prior to the social survey and dialogues with community stakeholders, project proponents intended to offer a limited set of social programs targeted directly at reducing community impacts on the Project Area. These early programs, building on work by OFI and World Education in the region, focused on conservation education and increased crop yields.

The results of the social survey made it clear that these measures would be insufficient. The development of oil palm in the region appears to be following the same course as in other parts of Indonesia, suggesting that the region will see an increase in conflicts and a diminishment in environmental services, even if the 'without project' scenario is successfully avoided. Already the region's ability to sustain traditional livelihoods is in decline. Fishing yields have decreased over the past few years with the rise of flooding, clean water is a scarce commodity, and oil palm companies have commenced a campaign of land seizures that will likely end only when all viable land has been usurped.

In discussions with community members, time and again access to clean water was listed as the top priority for any development program. After survey results were compiled, project proponents immediately began researching appropriate programs, and Potters for Peace was selected as the best candidate given local needs, project goals, and available resources.

Once project proponents understood the impoverished state of Project Zone communities, a more comprehensive effort at development commenced under the theory that only a broad-based, comprehensive socio-economic program would reduce the impact of Project Zone communities on the Project Area in a meaningful and permanent way. At this stage, project proponents adopted the UN Millennium Development Goals for Indonesia as a roadmap to community engagement. A number of additional programs linked explicitly to these goals (and referencing the needs of Project Zone communities as indicated in the social survey) were researched, budgeted, and incorporated as major project activities. Going forward, communities will again be consulted in order to refine, elaborate, and prioritize these programs.

In discussions with community members, it is clear that the following concerns are paramount to the various stakeholders and have been taken into account in the project plan.

1. Clean Water
2. Fishing Support – Since most communities in the project area are engaged in and make their living from fishing the project proponents will place a high priority to helping the communities to improve their capacity in this area.
3. Jungle Rubber (Jelutung) – Communities also see the ability to grow and tap rubber as another means of providing income to mitigate other activities that might be harmful to the project area.

In discussions with non-community stakeholder the reoccurring theme brought up by them was the need for ongoing communication and cooperation. Project proponents now have made it a priority to allocate sufficient resources including staff to maintain strong relationships with all stakeholders.

7. Project Activities &Implementation Schedule

Table 26. Rimba Raya Implementation Schedule, 2008-2039

Rimba Raya Implementation Schedule						
Project Phase	**Event / Milestone**	**Activity Description / Relevancy**	**Start Date**	**Finish Date**	**Status**	**Responsible Party**
1-Feasibility study	Meeting with Orangutan Foundation Intl.	Determine synergy between orang-utan conservation objectives and avoided deforestation	20-Mar-2008	21-Mar-2008	Complete	Todd Lemons
1-Feasibility study	Visit potential project site area	Survey current condition of forest, assess immediate local threat from palm oil	21-Mar-2008	23-Mar-2008	Complete	Todd Lemons
1-Feasibility study	Meet independently with three members of Commission 4 (development) of the Provincial legislature	Discuss new land-use plan that intends to convert Production Forests to Palm Oil	21-Mar-2008	25-Mar-2008	Complete	Todd Lemons / Biruté Galdikas
1-Feasibility study	Meet with Provincial Governor	Determine possibility of his support given historical support of palm oil	25-Mar-2008	25-Mar-2008	Complete	Todd Lemons / Biruté Galdikas
1-Feasibility study	Meet with Conservation Dept. of the Ministry of Forestry (PHKA)	Meet with "Head of Sub-Directorate" of the dept. in order to build support at lower levels within the agency.	8-Apr-2008	8-Apr-2008	Complete	Todd Lemons / Biruté Galdikas
1-Feasibility study	Meet with Conservation Dept. of the Ministry of Forestry (PHKA)	Meet with the "Director of Area Conservation" and "Director General" to explicitly outline the project plan and ask for support	9-Apr-2008	9-Apr-2008	Complete	Todd Lemons / Biruté Galdikas
1-Feasibility study	Deliver LOI to Ministry of Forestry	Lay out plan. Demonstrate common goals with OFI and define project area.	10-Apr-2008	10-Apr-2008	Complete	Todd Lemons / Biruté Galdikas
1-Feasibility study	Meet with Minister of Forestry	Determine level of support for the project. Ask for advice on how to proceed	12-Apr-2008	12-Apr-2008	Complete	Todd Lemons / Biruté Galdikas

1-Feasibility study	Commission "Desk Top Study"	Contract ForestCarbon to conduct a Desk Top Study of the Project area	1-Jun-2008	15-Aug-2008	Complete	Forest Carbon
1-Feasibility study	Application for "Area verification"	Local branch of the National Forestry Dept determines current legal status of project area and issues letter of approval if no legal conflicts with title or proposed activities	15-Sep-2008	1-Oct-2008	Complete	Todd Lemons / Prometheus
1-Feasibility study	Meet with Chiefs of the local villages	Determine level of support for the project. Discuss community concerns and needs	15-Sep-2008	18-Sep-2008	Complete	Infinite-Earth
2-Establishment of Rimba Raya Reserve	Establishment of offices	Administrative offices established in Jakarta and Pangkalanbun and field office established in Seruyan	1-Oct-2008	31-Dec-2010	Started	Infinite-Earth
2-Establishment of Rimba Raya Reserve	Project Design Document	Design & Development of the Rimba Raya REDD Project (PDD)	1-Oct-2008	15-Mar-2009	Started	Infinite-Earth
1-Feasibility study	Meet with Bupati of the Seruyan Regency	Determine level of support for the project. Discuss regency needs.	15-Oct-2008	18-Oct-2008	Complete	Todd Lemons
2-Establishment of Rimba Raya Reserve	Bupati's Letter of Recommendation	Bupati of Seruyan Regency signs letter of approval and recommendation of the project	1-Nov-2008	11/31/2008	Complete	Todd Lemons / Prometheus
2-Establishment of Rimba Raya Reserve	Biodiversity Study	Commission Biodiversity Study of project area	1-Nov-2008	15-Jan-2009	Complete	Daemeter
2-Establishment of Rimba Raya Reserve	Community Assessment	Commission Assessment for all communities in the project area to determine land tenure analysis, socio-economic status and needs, etc	1-Dec-2008	1-Feb-2009	Complete	Daemeter
2-Establishment of Rimba Raya Reserve	Governor's Letter of Recommendation	Governor of the Central Kalimantan province signs letter of approval and recommendation of the project	1-Dec-2008	15-Mar-2009	Pending	Todd Lemons /Dr. Galdikas
5-Extension of OFI Activities	Construction of orang-utan release centers & feeding platform	Four release stations will be built inside the project area, 1 per year for the first three years of the project	1-Dec-2008	31-Dec-2010	Started	Rimba Raya / OFI
6-Development of Social Buffer	Village Heads Meeting	OFI sponsored meeting of Project Zone Village Heads to discuss conservation issues.	23-Dec-2008	23-Dec-2008	Complete	OFI
6-Development of Social Buffer	Daemeter Social Survey	Daemeter field team visits villages in the Project Zone to gather info and elicit opinions on proposed project activities	23-Dec-2008	28-Dec-2008	Complete	Daemeter
2-Establishment of Rimba Raya Reserve	Agreement with BNP-Paribas	Contract for the purchase of REDD credits	15-Feb-2009	15-Apr-2009	Started	Infinite-Earth
2-Establishment of Rimba Raya Reserve	Technical Proposal	Submit Technical proposal (Project Operational Plan) to Dept of Forestry for review	1-Mar-2009	15-Mar-2009	Complete	IE Mgt Team / Sonokoling

2-Establishment of Rimba Raya Reserve	Technical Proposal	Present Technical proposal (Project Operational Plan) to Dept of Forestry and field questions & concerns.	15-Apr-2009	1-May-2009	Complete	IE Mgt Team / Sonokoling
2-Establishment of Rimba Raya Reserve	Fire Plan	Design and Implementation of comprehensive fire prevention and response plan	1-May-2009	1-Aug-2009	Complete	Marc Nicolas
2-Establishment of Rimba Raya Reserve	PDD Pre-validation	PDD submitted for pre-validation review	1-May-2009	31-May-2009	Complete	Rainforest Alliance
2-Establishment of Rimba Raya Reserve	PDD Translation and Dissemination	PDD translated into Indonesian and distributed to all stakeholders for the CCBA public comment period	1-May-2009	31-May-2009	Complete	Rini Firdaus / OFI / Rimba Raya
2-Establishment of Rimba Raya Reserve	Minister's Letter of Recommendation	Concession approved contingent on compliance with administrative steps	1-Jun-2009	30-Jun-2009	Complete	IE Mgt Team / Prometheus
2-Establishment of Rimba Raya Reserve	Monitoring Plan	Design & Development of Monitoring Plan	1-Jun-2009	15-Jun-2010	Complete	Forest Carbon / Daemeter
2-Establishment of Rimba Raya Reserve	Phase 2 Biodiversity and Community Assessments	CCBA validation and verification	1-Jun-2009	15-Jan-2010	Complete	Daemeter
2-Establishment of Rimba Raya Reserve	CCBA Validation	PDD posted to CCBA website and project validation commences, triggering public comment period	1-Jun-2009	15-Feb-2010	Complete	RRC & World Education
2-Establishment of Rimba Raya Reserve	2nd Validation of Methodology	Receive 1st validation of methodology, receive 2nd validation	1-Jun-2009	23-Aug-2010	Complete	Bureau Veritas
6-Development of Social Buffer	Public comment meetings	Meetings in Project Zone communities to describe project and elicit comments	1-Jun-2009	30-Dec-2009	Complete	Rimba Raya/ OFI
5-Extension of OFI Activities	Release of rehabilitated orang-utans	The coordinated release of 300 rehabilitated orang-utans into the project area	15-Jun-2009	31-Dec-2012	Started	Rimba Raya / OFI
2-Establishment of Rimba Raya Reserve	Environmental Impact Assessment	Conduct Environmental Impact Study per Dept of Forestry Regulations for final approval	1-Janl-2010	15-Apr-2010	Complete	PT Focus
6-Development of Social Buffer	Community consultations	Series of meetings with Project Zone communities to elaborate and prioritize social programs	1-Aug-2009	31-Aug-2010	Complete	Rimba Raya
6-Development of Social Buffer	CCBA Validation	Initial (1of2) Public Comment Period	1-May-2010	30-May-2010	Complete	RRC & World Education
6-Development of Social Buffer	CCBA Validation	CCBA formal Public Comment Period	1-Sep-2010	30-Sep-2010	Complete	RRC & World Education
2-Establishment of Rimba Raya Reserve	Minister's Decree granting IUPHHK Concession Rights	Final approval of the Rimba Raya rehabilitation and restoration concession license	1-Sep-2009	15-Jul-2011	Pending	IE Mgt Team / Rimba Raya

6-Development of Social Buffer	Establishment of community committees	Establish system of community involvement in day-to-day operations, process and procedural rules for decision making, arbitration, etc. using existing socio/political/judicial structures (village counsels, tribunals)	1-Jan-2010	15-Dec-2010	Started	Rimba Raya / OFI
2-Establishment of Rimba Raya Reserve	VCS Verification	VCS verification commences	21-April-2010	15-Oct 2010	Started	SCS
3-Execution of Rimba Raya Operational Plan	Guard Posts	Up to 20 guard posts built at strategic locations across the Reserve, an average of 4 per year for the first 5 years of the project	1-Jan-2011	31-Dec-2011	Started	Infinite-Earth / OFI / Rimba Raya
3-Execution of Rimba Raya Operational Plan	Hiring and training of new personnel	Project Manager, Community Relations Manager, and new guards hired and trained	1-Jun-2010	31-Dec-2011	Started	Infinite-Earth / OFI / Rimba Raya
3-Execution of Rimba Raya Operational Plan	Training of fire brigade	Initiate Fire Training under BKSDA supervision, organize fire brigade	12-Jul-2010	31-Dec-2011	Started	Infinite-Earth /Rimba Raya
4-Co-Management of Tanjung Puting	Execution of Co-Management Agreement with TPNP Authority	Become an additional party to the existing and historical co-management agreement between OFI and TPNP	1-Jun-2010	1-Dec-2010	Started	Rimba Raya / OFI
5-Extension of OFI Activities	Construction of orang-utan remote feeding platforms	Four supplemental feeding platforms will be built inside the project area	1-Jun-2010	31-Dec-2011	Started	Infinite-Earth / OFI / Rimba Raya
7-Outreach and Education	Biotracker development	Design and development of proprietary Biotracker implant	1-Jun-2009	31-Dec-2010	Started	Infinite-Earth / SirTrack
6-Development of Social Buffer	Annual grants to World Education	Grants to expand World Education community activities in project zone	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth
4-Co-Management of Tanjung Puting	Commencement of annual grants to TPNP	Grants to fund TPNP conservation activities	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth
4-Co-Management of Tanjung Puting	Training of TPNP guards and staff	Bring in outside military and police training personnel to adequately train and equip staff	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya / OFI

5-Extension of OFI Activities	Commencement of annual grants to OFI	Grants to fund OFI orang-utan conservation and rehabilitation activities	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth
6-Development of Social Buffer	Community centers & libraries	2-3 community centers & libraries will be built, 1 in Baung and 1 in Muaradua	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya / OFI
6-Development of Social Buffer	Water filtration systems	Development of community based clean filtration system via "Potters for Peace"	1-Sept-2010	31-Jul-2011	Started	Rimba Raya
6-Development of Social Buffer	Fuel efficient clean-tech sustainable cook stoves	Finance and distribution of Fuel efficient clean-tech cook stoves to each household	1-Sept-2010	31-May-2011	Started	Rimba Raya
6-Development of Social Buffer	Aquaculture program	Fund technical consultants on creating a high yield, low impact fish farms from existing man-made lakes	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya
7-Outreach and Education	Orangutan study	Design and setup of orang-utan tracking study	1-Nov-2010	31-May-2011	Pending	Rimba Raya / OFI
2-Establishment of Rimba Raya Reserve	CCBA Verification	Receive CCBA Gold Validation	7-June-2010	15-Oct-2010	Started	SCS
6-Development of Social Buffer	Early Childhood Education & Development (ECED)	Begin stocking materials and hiring trainer / instructors for the ECED programs at the 2-3 community centers	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya / OFI / World Education
7-Outreach and Education	Interactive educational platform	Creation of an interactive educational platform around the content of the research study	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya / Infinite-Earth
3-Execution of Rimba Raya Operational Plan	Implementation of Monitoring Plan	Execution of Monitoring Plan	1-Jun-2011	31-Dec-2039	Started	Forest Carbon/ Daemeter / OFI / Rimba Raya
6-Development of Social Buffer	Immunization Program	Launch disease prevention & immunization program	1-Jun-2011	31-Dec-2039	Pending	Rimba Raya
3-Execution of Rimba Raya Operational Plan	Construction of fire towers	5 fire towers built at strategic locations across the Reserve, 1 per year for the first 5 years of the project	15-Dec-2010	31-Dec-2014	Pending	Rimba Raya
6-Development of Social Buffer	Commencement of micro-credit program	Provide micro-finance program to local communities for agriculture, aqua-culture and other enterprise development	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth
6-Development of Social Buffer	Construction of floating clinic	Phinisi floating clinic built; operations commence along Seruyan river	1-Jun-2011	31-Dec-2012	Pending	Rimba Raya
6-Development of Social Buffer	Develop Eco-Tourism program	Create a “sister city” (sister village) type program with the Seminole Indian communities in the	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth

		Florida Everglades				
6-Development of Social Buffer	ECED Program	ECED program commences in Project Zone community centers	1-Jun-2011	31-Dec-2039	Pending	Infinite-Earth
3-Execution of Rimba Raya Operational Plan	Phase I-III Rehabilitation of degraded habitat	Rehabilitation of degraded habitat via a multi-story mixed indigenous species natural forest & community based cash crop agro-forestry approach	1-Jun-2012	31-Dec-2039	Pending	Rimba Raya

8. Ownership

8.1 Proof of Title:

Provide evidence of proof of title through one of the following:

- a legislative right;
- a right under local common law;
- Ownership of the plant, equipment and/or process generating the reductions/removals;
- A contractual arrangement with the owner of the plant, equipment or process that grants all reductions/removals to the proponent

The project proponents have secured provisional tenure to the Carbon Accounting Area in accordance with government procedures for obtaining an ecosystem restoration license (IUPHHK-RE). According to **Regulation No: P-61 (2008)** Provisions and Procedures for Issuing Ecosystem Restoration Permits, the Ecosystem Restoration license is granted through applications and regulated by the Minister of Forestry based on Article 35 paragraph (3), Article 36 paragraph (5), Article 62 and Article 68 of **Government Regulation GR No. 6 (2007)** in conjunction with **Government Regulation GR No. 3 (2008)** on Forest Arrangement and Formulation of Forest Management and Utilisation Plans.

The IUPHHK-RE license confers carbon rights to the project proponent as specified in **Article 33 of GR No. 6 (2007) and GR No. 3 (2008):**

Article 33

(1) The utilization of environmental service in the production forest as meant in Article 31 paragraph (2) letter b shall be done through, among others, business activities of:

a. utilization of water bank;
b. utilization of water;
c. eco tourism;
d. protection of biological diversity;
e. environmental rescue and protection; or
f. absorption and/or storage of carbon.

Independent legal opinion confirms the relevance of these regulations and verifies that the IUPHHK-RE confers carbon trading rights (see Annex 12A).

The major milestones of the license process are described below (Table 27) and shown in the flow diagram (Figure 30) illustrating the procedure for obtaining the IUPHHK-RE. Key regulatory documents and government letters produced for the Rimba Raya Ecosystem Restoration license are included in Annex 12B. Additional supporting documents related to the project proponent's carbon ownership are available for review by project validators.

The application for the Rimba Raya Restoration Concession has been approved by the Seruyan District (Nov 2008), Central Kalimantan Province (Jul 2009) and Indonesian Ministry of Forestry (Dec 2009), and the final decree is in the process of being issued. While District and Provincial approval are not federally regulated, these provide important assurances for project land use rights on the ground.

The Area Verification Map (Figure 31) issued by the Ministry of Forestry specifies the concession boundaries or Project Management Zone. Note that the Indonesian government does not differentiate the (smaller) carbon project boundary inside the PMZ but instead recognizes the entire concession within which carbon trading activities are allowed. The first Area Verification Letter issued October 10, 2008 showed the

original 101,730 ha Rimba Raya area, which included the already-developed KUCC oil palm plantation. The plantation was later excised from the Rimba Raya concession, as referenced by **Ministerial Decree SK-617** to produce the final Rimba Raya Area Verification Map of 89,185 ha. (Note the Indonesian government letters report the Rimba Raya PMZ as 89,185 ha, and the Area Verification map as 90,830 ha, whereas the project proponents calculate these same map boundaries as 91,215 ha using the most current ArcGIS software. For consistency in project area calculations, the project proponents use GIS-based numbers in the VCS PD. This ~2% discrepancy in the legal description and GIS boundary of the PMZ does not affect the Carbon Accounting Area or the 3km buffer zone around the Carbon Accounting Area.)

Following Area Verification, the Minister of Forestry allocated the Rimba Raya concession for Ecosystem Restoration use and instructed Forestry Planning to make an immediate change to the forest use designation from HPK (conversion forest) to HP (production forest) which bars conversion to palm oil and enables an RE license to be granted. Forestry Planning complied with this request indicated in their letter changing the designation of the Rimba Raya concession to HP forest use. Both of these letters refer to the 89, 185 ha Rimba Raya concession.

Following the Area Verification process, the Minister of Forestry conditionally approved the Rimba Raya concession and instructed project proponents to complete an environmental review, indicated in the **SP1** letter. The SP1 confers exclusive (although perpetually provisional) rights to use by the concession holder, as it bars all other applications according to Article 9 of Regulation P-61. After Rimba Raya successfully completed the Environmental Impact Assessment (UKL/UPL), the Minister then approved the Rimba Raya Environmental Report (UKL/UPL) as ordered by the SP1 and confirmed that project proponents had met all requirements necessary to obtaining the ecosystem restoration license (IUPHHK-RE) as indicated by Ministerial Letter **SP2**. In the final major step of the licensing process, the Minister has ordered the Working Area Map to be formalized in the permanent records of the department and has instructed the legal department to draft the final decree for his signature.

Note that tenure is perpetually conditional, being reviewed every 5 years by the Minister as the basis for continuation of the permit in accordance with Article 17 of Regulation P-61.

Table 27. Milestones in the IUPHHK-RE License Process for Rimba Raya

Milestone	Description	Regulation	Date	Document
Application & Technical Proposal	Concession applicants are required to develop a comprehensive operational plan and present it to a panel of 12+ members of the Ministry of Forestry. Copies are submitted to the Governor (Seruyan District) and Head of the Provincial office (Central Kalimantan).	P-61 Art 4,5	submitted Sep 15, 2008 approved Oct 13, 2009	Technical Proposal (available for review) Lm. 147 Letter (Annex 12B)
Area Verification	Government-issued letter and map indicating the license area boundaries and confirming that there are no conflicting recognized claims to the Project Area.	P-61 Art 6	Oct 10, 2008 Oct 5, 2009 2009	S. 897 Letter (Annex 12B) SK-617 (Annex 12B) Boundary Map (Figure 31)

Allocation of area for Ecosystem Restoration	Letter from Ministry of Forestry (SK-617) allocating the entire Rimba Raya concession for Ecosystem Restoration (RE) use and ordering a forest use re-designation from HPK (conversion forest) to HP (production forest) in order to meet the requirement of an RE license.	P-61 Art 2	Oct 5, 2009	SK-617 Letter (Annex 12B)
Re-designation of Land Use	Letter from Forestry Planning acting on the SK-617 instruction from Ministry of Forestry and changing the forest use designation from HPK (conversion forest) to HP (production forest) as required by the RE license	P-61 Art 2	Nov 24, 2009	S-1046 Letter (Annex 12B)
Approval by the District Governor	Letter of approval for the Rimba Raya IUPHHK-RE license by the Head of Seruyan District. Grants support for the project and recommends that the national government issue the Ecosystem Restoration license.	not Federally Regulated	Nov 18, 2008	522.1/368 Letter (Annex 12B)
Approval by the Provincial Governor	Letter of approval for the Rimba Raya IUPHHK-RE license by the Head of Central Kalimantan Province. Shows support at the Provincial level and recommends that the national government issue the Ecosystem Restoration license.	not Federally Regulated	Jul 16, 2009	522/896 Letter (Annex 12B)
Approval by the Central Government (SP1)	National-level approval of the project by the Minister of Forestry. This document is given after the Minister approves the technical proposal and bars all other applications for the Project Area. This document signals official sanction of the project and gives the holder provisional rights to use pending completion of administrative steps. The SP1 also instructs the project proponent to complete the UKL/UPL environmental study.	P-61 Art 8	Dec 29, 2009	S.958 (SP1) Letter (Annex 12B)
Environmental & Social Impact Study (UKL/UPL)	Project proponents engaged PT Focus Consulting Group, a licensed third party consultant to conduct a comprehensive environmental impact assessment (UKL/UPL) and formal community presentations as required by the SP1.	P-61 Art 11	April, 2010	Report available for review
Approval of UKL/UPL by Provincial Goverment	The UKL/UPL must be approved in writing by the Provincial Environmental Department.	p-61 Art 11	Apr 12, 2010	No.660 Letter (Annex 12B)
SP2 Letter	Upon completion and approval of the UKL/UPL, the Minister of Forestry issues this	P-61 Art 12	Jun 15, 2010	S.291 (SP2) Letter

	internal document instructing the Director General of Planning to formalize the Working Area Map, which will serve as the final map for the concession license.			(internal government document furnished to validators)
Final Working Area Map	After receiving instructions via the SP2, the Head of Forestry Planning finalizes the Working Area Map, which will accompany the Minister's Decree.	P-61 Art 12	Ordered Aug 18, 2011	
SK (Decree)	Minister's Decree officially authorizing the IUPHHK-RE	P-61 Art 12	Expected Sep 15, 2011	

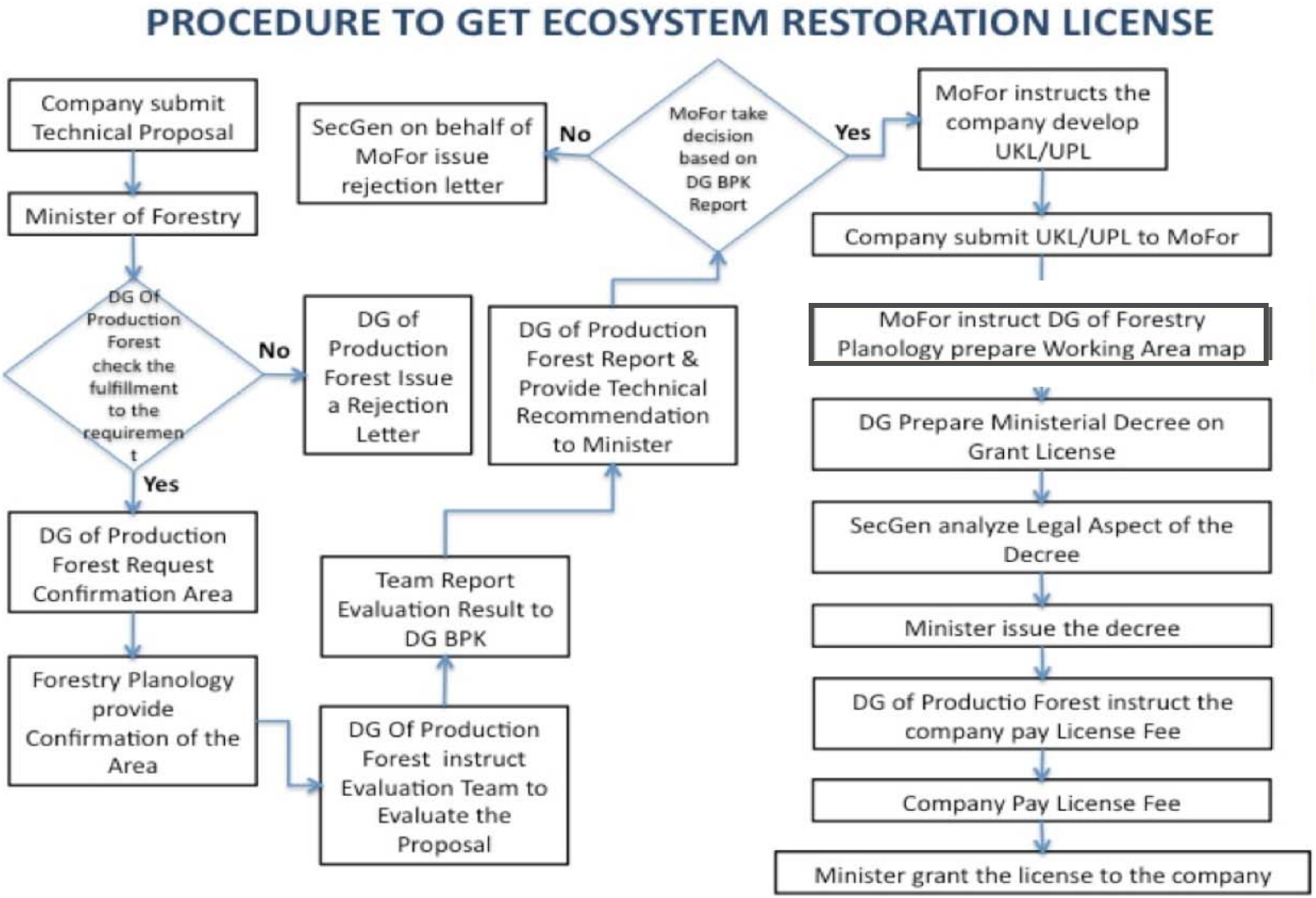


Figure 30. Flow chart for obtaining the Conservation & Restoration Concession License in Indonesia.

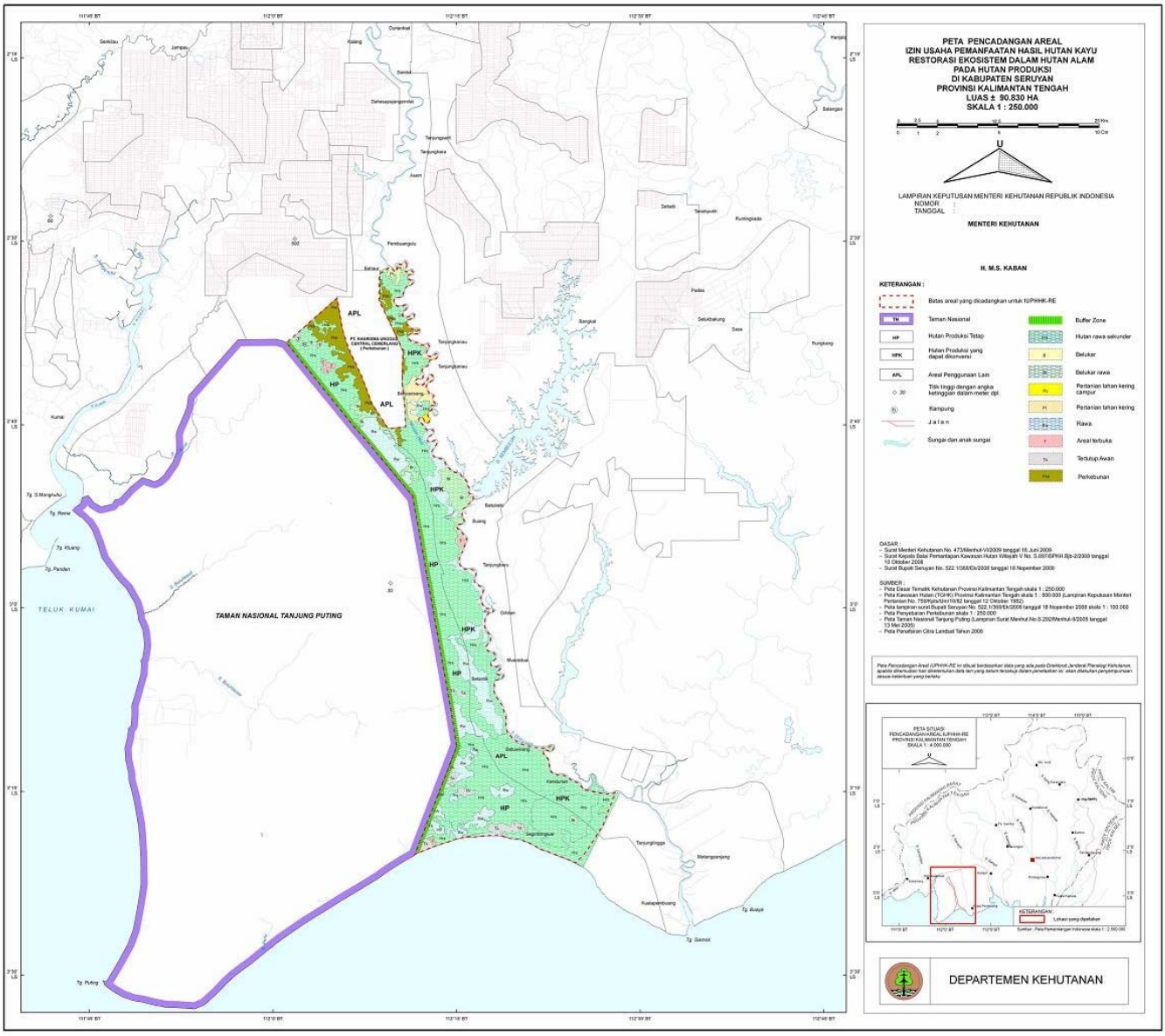


Figure 31. Final Area Verification Map of the Rimba Raya Concession showing the Project Management Zone

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