RIMBA RAYA BIODIVERSITY RESERVE PROJECT – MONITORING AND IMPLEMENTATION REPORT

(01 JULY 2014 – 22 JUNE 2017)

Document Prepared By InfiniteEARTH Limited and ecoPartners LLC

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GHG Accounting/Crediting Period	*01-July-2014 to 22-June-2017*
Monitoring Period of this Report	*01-July-2014 to 22-June-2017*
History of CCB Status	*Validation:14-October-2011* *Most recent verification:09-January-2014*
Gold Level Criteria	*Exceptional Climate Adaptation Benefits: The climate-related project activities work to create food security, produce alternative sources of revenue, ensure healthier communities and protect biodiversity. Project activities to help achieve these benefits include fire suppression/education/training, soil enrichment, reforestation, agroforestry, crop rotation/diversification, forest protection and aquaponics, among others.* *Exceptional Community Adaptation Benefits: The community-related project activities provide benefits which include increased food security, the empowerment of women and other poor, vulnerable and marginalized groups, as well as increased economic opportunity and improved water quality and sanitation. Project activities to achieve these benefits include creation of job opportunities related to the Reserve, fire patrols, community based agroforestry programs, development of a social buffer and the construction of community centers, among others.* *Exceptional Biodiversity Adaptation Benefits: The biodiversity-related project activities provide benefits which include the protection of 54 species listed as Critically Endangered or Endangered by IUCN, 17 of which are confirmed present in the bordering Tanjung Puting National Park (TPNP). An additional 40 species listed as Vulnerable by IUCN are likely present in the Project area, 13 of which are confirmed in TNTP.*

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1 SUMMARY OF PROJECT BENEFITS

The Rimba Raya Biodiversity Reserve Project, an initiative of InfiniteEARTH, has reduced Indonesia's emissions by preserving tropical peat swamp forest, avoiding deforestation, drainage and conversion to palm oil plantation. Bordering the eastern boundary of the Tanjung Puting National Park in the Seruyan River watershed, Rimba Raya is rich in biodiversity including the endangered Bornean orangutan. Under the baseline scenario, the project area was slated by the Provincial government to be converted into four palm oil estates. These planned estates now comprise the 47,237 hectare Rimba Raya Carbon Accounting Area, which is monitored for the life of the project to protect and account for Rimba Raya carbon stores. The project monitors and reports on the Project Carbon Accounting Area, a 3km buffer zone surrounding the Project Carbon Accounting Area (collectively known as the Total Project Management Zone), and an extensive leakage belt. These monitored areas are fixed throughout the entire crediting period.

During this monitoring period, Rimba Raya has shown substantial climate benefits from avoided emissions. The project has also demonstrated that the rights and needs of local communities have been appropriately addressed as well as important biodiversity conservation issues. This monitoring and implementation report is a reflection of the progress made by the project within the last three years in terms of its emissions reductions and REDD goals, as well as its climate, community and biodiversity objectives.

1.1 Unique Project Benefits

The project generates unique benefits in terms of climate, community and biodiversity. The Rimba Raya Biodiversity Reserve is located in the tropical peat swamp forest on the southern coast of Borneo in Central Kalimantan province, Indonesia. The location of the project allows for a unique contribution towards mitigating the effects of climate change because Indonesia ranks as the world's third largest emitter of greenhouse gases despite being a non-industrialized nation whose economy accounts for less than 1% of global GDP (World Bank and IMF Global Rankings - 2008).

The construction of palm oil plantations destroys more than 25,000 square kilometers of forestland that is home to dozens of endangered species as well as impoverished communities who face looming economic forces that threaten to appropriate land that has been their home for generations. As such, the Rimba Raya Biodiversity Reserve Project is in a unique position to address the deforestation occurring in Indonesia.

During this monitoring period, in addition to the standardized benefits, the project has achieved important climate, community and biodiversity benefits which are exemplified with the following progress:

1. The construction of three guard posts in the Natai Kopi area (North Unit), Kudung (South Unit) and Sigintung area (Central Unit) have been completed using community employment.

These guard posts are especially important because they are located in areas vulnerable to fire. Fire vulnerability has been determined through field surveys completed by the Rimba Raya field staff and Tanjung Puting National Park staff. Construction has also been in started for hydrant wells in several locations.

2. With planning completed, the building of a new orangutan release/feeding station was completed in early 2017. 10 orangutans were released in February 2017 from this station and 9 were released in May 2017.

3. 73 field staff personnel from 14 different villages have been hired for monitoring work in the project, 18 of which are women. An additional 22 women from local villages are involved in project-related employment. Continued progress is being made in developing various economic working groups so that local community members can seek alternative livelihoods and/or employment directly related to the project.

4. 1,872 water filters and 1,671 solar lanterns have been distributed among 9 villages. 11 units of 60 watt solar panels have been installed along with 11 solar generator units operating at 1 kW.

5. Through World Education's food security program, an official working group dedicated to sustainable fishery has been created.

6. In the buffer planting program, 179,145 seedlings were purchased and planted. Seedlings were sourced and purchased from village nurseries that are supported by individuals and families from the community whose labor grows and maintains the seedlings.

7. Continuation for women's capacity building is occurring. Progress has included working to secure financial support for chicken meat and egg working groups as well as recyclable handicrafts.

8. 99 fuel efficient cook stoves have been distributed since October 2013.

9. Continuation of land cover and fire danger monitoring occurs twice monthly (each). Likewise, routine patrol is carried out twice monthly to monitor for logging outside of what is permitted by the project. Maps of areas that are vulnerable to logging have been created. Any instances of illegal logging have been documented throughout this monitoring period.

10. Hunter Education is being carried out at the Forest Field School at the junior high and high school levels.

11. In 2016, 2 village libraries were built. Planning and construction currently continues for 2 more village libraries.

12. Roughly 44,000 hectares of peat swamp have continued to be protected and prevented from conversion to oil palm plantation.

13. In the table below, project-specific outcomes and impacts from this monitoring period are discussed.

Outcome or Impact	Achievements during the Monitoring Period	Section Reference	Achievements during the Project Lifetime
Create food security	0.6 ha of pineapple and djengkol plantation grown as part of agroforestry program. Providing alternative sources of income revenue through forest guard patrols and fire fighting Additional sources of protein (chicken and eggs) through the development of a chicken farm.	2.2.1 2.2.6 4.1 4.4.2	Community-based, cash crop agro-forestry project based on multi-story/multi-crop plantations of native species cash crops, inter-planted with rare species (such as ramin and meranti) in a matrix of secondary forest regrowth, establishment of alternative sources of revenue
Produce alternative sources of revenue	Hiring of more local guards and fire patrols, furthered employment of women and micro-credit finance directed at women-specific entrepreneurial pursuits The Farmer's Field School has helped implement new programs throughout the project area, such as a chicken farm, shrimp paste packaging, and fish cages.	2.2.1 2.4.3 4.1 4.2.3	Establishment of village-run seedling nurseries, agroforestry and aquaculture programs
Ensure that communities are healthier	Distribution of 99 more fuel efficient cook stoves, continued construction/financial budgeting	2.1.10 2.2.1	Social buffer program establishment, social mapping activities,

	for floating clinic, distribution of 1872 water filters	4.1.1 4.3.2 4.4.2	construction of community centers, fuel efficient stove distribution, implementation of clean water systems
Rehabilitate riparian zones	Continuation of guard post construction and hiring of guards, seedling planting from village-operated nurseries (180,000 seedlings from 20 different species), continued monitoring of project zone and area – including buffer zones, continued funding for OFI activities, continued support and coordination with TNTP staff	4.1.1 5.1 5.2.2	Support of OFI and TNTP buffer area, replantation and reforestation efforts in degraded and vulnerable areas, monitoring of riparian zones
Increase presence of vulnerable and endangered species	Continued monitoring of species present in project zone and nearby TNTP – especially vulnerable and endangered species, creation of community centers to supply information and training, continued training and patrol of fire, continued guard patrols for illegal activities and oil palm expansion	4.1.1 4.4.2 5.1.2 5.3	Biodiversity monitoring, support of OFI and TNTP activities, education awareness, fire planning, oil palm expansion prevention

1.2 Standardized Benefit Metrics

In addition to the unique benefits listed and described in the table above, the Rimba Raya Biodiversity Project has also accomplished other benefits relevant to VCS and CCB standards. These achievements are listed and briefly decribed below.

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
GHG emission Reductions & removals	Net estimated emission removals in the project area, measured against the without-project scenario	N/A	N/A	N/A
	Net estimated emission reductions in the project area, measured against the without-project scenario	11,163,715 tCO_2e	3.2	28,782,463 tCO_2e
Forest cover	For REDD projects: Number of hectares of reduced forest loss in the project area measured against the without-project scenario	15,309.6 ha	3.2	40,000 ha
	For ARR projects: Number of hectares of forest cover increased in the project area measured against the without-project scenario	N/A	N/A	N/A
Improved land management	Number of hectares of existing production forest land in which IFM practices have occurred as a result of the project's activities, measured against the without-project scenario	N/A	N/A	N/A
	Number of hectares of non-forest land in which improved land management has occurred as a result of the project's activities, measured against the without-project scenario	47,237 ha	1 3.2 5.1	47,237

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
Training	Total number of community members who have improved skills and/or knowledge resulting from training provided as part of project activities	4,225 people	2.4 4.1 4.3	4,225 people
	Number of female community members who have improved skills and/or knowledge resulting from training provided as part of project activities of project activities	1,978 women	2.4 4.1 4.3 4.4.2	1,978 women
Employment	Total number of people employed in of project activities, expressed as number of full time employees	73 people	2.4 4.1 4.3	73 people
	Number of women employed in project activities, expressed as number of full time employees	18 women	2.4 4.1 4.3 4.4.2	18 women
Livelihoods	Total number of people with improved livelihoods or income generated as a result of project activities	1,103 people	4.1 4.2.1 4.3.1	1,103 people
	Number of women with improved livelihoods or income generated as a result of project activities	516 women	4.1 4.2.1 4.3.1 4.4.2	516 women
Health	Total number of people for whom health services were improved as a result of project activities,	3,051 people	2.2.1 4.1.2 4.4.2	3,051 people

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	measured against the without-project scenario			
	Number of women for whom health services were improved as a result of project activities, measured against the without-project scenario	1,428 women	2.2.1 4.1.2 4.4.2	1,428 women
Education	Total number of people for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	10,682 people	2.2.1 3.3 4.1 4.3 4.4	10,682 people
	Number of women and girls for whom access to, or quality of, education was improved as a result of project activities, measured against the without-project scenario	5,000 women	2.2.1 3.3 4.1 4.3 4.4	5,000 women
Water	Total number of people who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the without-project scenario	5,520 people	2.2.1 4.1.1 4.3.2	5,520 people
	Number of women who experienced increased water quality and/or improved access to drinking water as a result of project activities, measured against the	2,584 women	2.2.1 4.1.1 4.3.2 4.4.2	

Category	Metric	Achievements during Monitoring Period	Section Reference	Achievements during the Project Lifetime
	without-project scenario			
Well-being	Total number of community members whose well-being was improved as a result of project activities	14,822 people	2.1.10 4.1.2 4.4.2	14,822 people
	Number of women whose well-being was improved as a result of project activities	7,205 women	2.1.10 4.1.2 4.4.2	7,205 women
Biodiversity conservation	Change in the number of hectares significantly better managed by the project for biodiversity conservation, measured against the without-project scenario	47,237 ha	5.1.2 5.2	47,237 ha
	Number of globally Critically Endangered or Endangered species benefiting from reduced threats as a result of project activities, measured against the without-project scenario	8 species confirmed this monitoring period	5.1.1 5.1.2 5.3	8 confirmed, 17 likely

2 GENERAL

2.1 Project Description

2.1.1 Implementation Description

In May 2013, the Project achieved validation and its first verification for the period 1 July, 2009 – 30 June, 2010. The project's second verification was completed on the on the 9 December, 2013 and the third verification was completed on 30 June, 2014. The fourth monitoring period for VCS is covered by this report (i.e. 1 July 2014 - 22 June 2017). Additionally, the third CCB monitoring period extends from January 2014 to June 2017. Despite several wildfires that impacted the project

area and the project's overall emissions reductions, this monitoring period the project achieved a total of 11,163,715 tCO2e of net emissions reductions due to project activities. The project has accounted for ongoing leakage due to peat drainage in areas that were cleared during the specified 5-year monitoring period, and has taken preventative measures to increase the organization's capacity to respond to wildfires that might threaten the project's carbon stocks in the future.

The project's initial climate objectives were to stop encroachment from palm oil plantations in the project area, and to create a physical barrior between palm oil plantations and the Tanjung Putting National Park. The project's initial biodiversity objectives were to expand the contiguous habitat of the national park eastward to the Seruyan River, and to support OFI's work in the region. Finally, initial community objectives were to actively engage communities in the project zone to improve access to health care, employment, education, capacity-building opportunities, and other government services, as well as improve food security within communities. During this monitoring period, Rimba Raya identified several new community related objectives for the project including the following:

- At least 25% of the poorest people in each community where the project works will benefit from the project
- Engage with 25% of the poorest people in each community that the project works with to identify and overcome barriers and risks to project benefits
- Avoid or mitigate negative impacts in each community that the project works with, including for the women, as well as poor, vulnerable, or marginalized individuals.

To improve the quality of project activities and relevance of monitoring results, project management and staff undertook a detailed assessment of project activities by developing a detailed Theory of Change model (see Section 4.1.1). The Theory of Change model was constructed using guidance from the handbook for Social and Biodiverstiy Impact Assessment, and the model was additionally analysed to identify potential negative impacts on women, poor, vulnerable and marginal groups (see Section 4.4). With respect to monitoring of community impacts, new monitoring indicators were identified from the exercise and incorporated into the monitoring plan (see Section 4.3).

Project activity targets for this monitoring period were to intensify Reserve monitoring and protection measures, continue community support mechanisms and further biodiversity related protection through monitoring and activity affiliations with OFI and TNTP. During this monitoring period, the implementation of technologies and measures included the continued growth of the guard post network. Two new guard towers were constructed during this monitoring period as hiring and training of guards has continued. Likewise, fire patrol efforts were continued during this monitoring period. Since 2014, full crews have been established in all 3 field units, and all have been provided with basic firefighting, safety training and have also been equipped with appropriate pump kits (pumps, hose, nozzles, hand tools).

In terms of operation, a multitude of project activities have successfully continued during this monitoring period. Aside from guard patrols and fire protection, progress was made in the follow planned project activities: buffer enrichment and rehabilitation, community based agroforestry program implementation, funding and assistance of OFI and TPNP activities, construction of community centers, aquaculture productivity, establishment of clean water systems, distribution of fuel efficient stoves, installation of low maintenance solar lighting, creation of a floating health clinic as well as capacity building and micro credit program enactment.

2.1.2 Project Category and Activity Type

The Rimba Raya project follows the framework of Reducing Emissions from Deforestation and Degradation (REDD) through Avoided Planned Deforestation (APD). This project is not a grouped project.

2.1.3 Project Proponent(s)

Organization name	InfiniteEARTH
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Table 1: Information for the project proponent

2.1.4 Other Entities Involved in the Project

Organization name	Orangutan Foundation International (OFI)
Role in the project	Forest Protection, Ground Surveying
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Title	President, Head of Field Operations
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Email	

Organization name	World Education Indonesia (World Education, WE, or WEI)
Role in the project	Community Development, Education, Technical Advising and Consultation
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Organization name	ecoPartners LLC
Role in the project	Remote Sensing, Land Use Change Analysis, VCS/CCB verification support services
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Address	2930 Shattuck Ave Suite 305 Berkeley, California 94705
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Email	plozano@ecopartnersllc.com

Organization name	PT Pandu Maha Wana Asia Pacific Consulting Solutions
Role in the project	Field Staff, Measuring and Monitoring, Forest Protection, Community Development, Ecosystem Restoration, *contracted until 2015*
Contact person	

Title	
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Email	

Organization name	Environmental Accounting Services (EAS)
Role in the project	VCS/CCB verification support, *limited third party consulting assistance to ecoPartners*
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Table 2: Information for the project partners

2.1.5 Project Start Date (G3.4)

The Rimba Raya project start date is November 31, 2008. This corresponds with date in which the Bupati of Seruyan Regency signed the letter of approval and recommendation of the project, thus establishing the Reserve. The project lifetime is 60 years, thus the project end date is December 31, 2069.

2.1.6 Project Crediting Period (G3.4)

This monitoring report presents the results of the fourth monitoring period (M4) commencing 1 July, 2014 and ending 22 June, 2017. The total number of years covered by this monitoring report is three (3).

The initial project crediting start date was July 1, 2009 which corresponds with the date in which field crews were sent into the project area to begin the baseline assessment. The project has a 30 year crediting period.

The first project operational year was 2009-2010. This year was verified against the Verified Carbon Standard (VCS) only. The second monitoring period (1 July, 2010 – 30 June, 2013) and third monitoring period (1 July, 2013 - 30 June, 2014) were verified against both the VCS and the CCB Standards, with the CCB Monitoring period ending on 9 January, 2014. This fourth monitoring period is seeking verification under the VCS and CCB Standards, from 9 January 2014 – 22 June 2014 for CCB, and from 1 July 2014 – 22 June 2017 for VCS.

2.1.7 Project Location (G3.3)

The project is located in the Seruyan Regency, in the province of Central Kalimantan, Indonesia. The Project 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. There have been no changes to the project location since validation. The project area can be seen within greater regional area in the image below (Figure1).

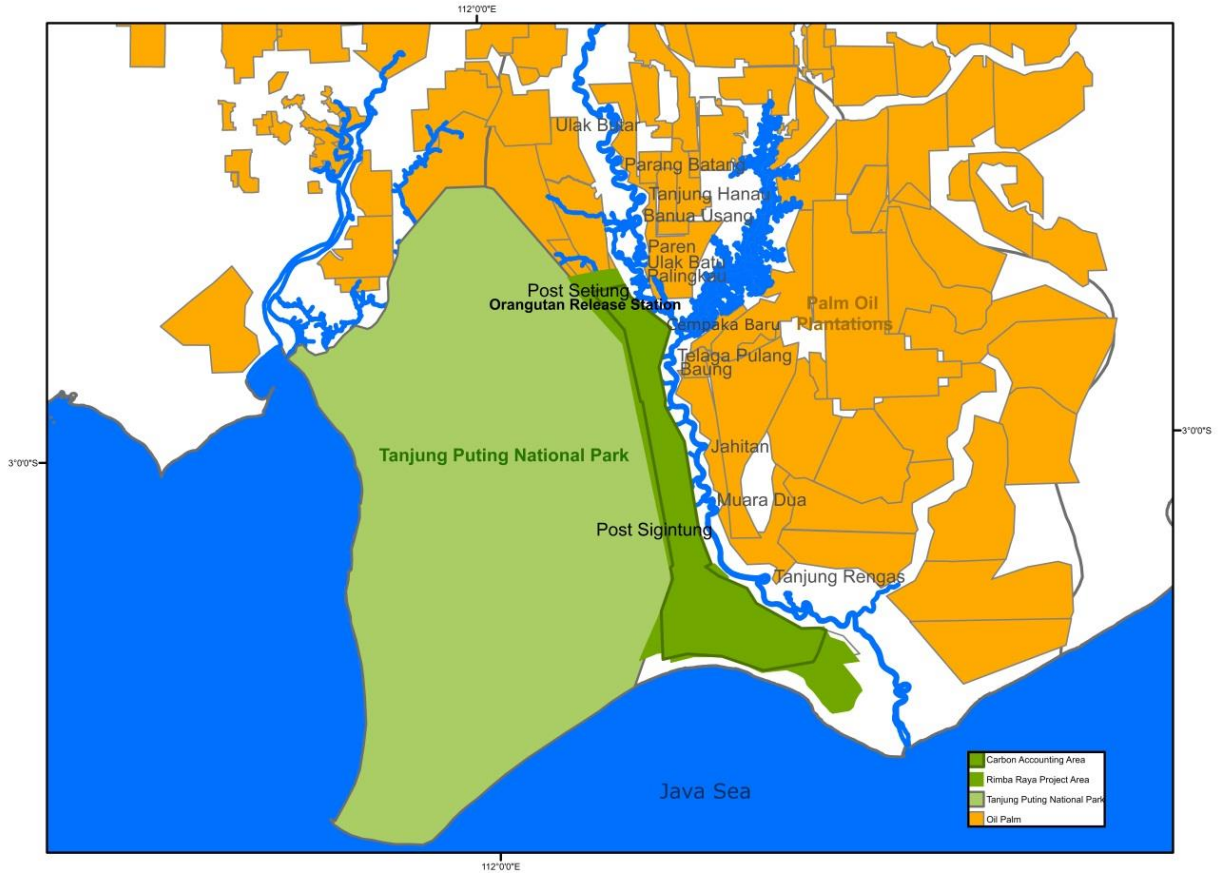

Figure 1: The Regional Location of the Rimba Raya Project

2.1.8 Title and Reference of Methodology

The Rimba Raya Project follows the framework of Reducing Emissions from Deforestation and Degradation (REDD) through Avoided Planned Deforestation (APD). The project employs the VM0004 Methodology for Conservation Projects that Avoid Planned Land Use Conversion in Peat Swamp Forests, v1.0. The project also employs the AFOLU Non-Permanence Risk Tool v3.3. This project is not a grouped project.

2.1.9 Other Programs (CL1.5)

As of this monitoring period, the Rimba Raya Biodiversity Reserve Project is not registered with any other GHG program. Likewise, The Rimba Raya Biodiversity Reserve Project neither has, nor intends to generate any other form of GHG-related environmental or GHG emission reductions or removals during this monitoring period. The project has never been previously rejected by any other GHG program.

2.1.10 Sustainable Development

The Sustainable Development Goals are an adaptation of the Millennium Development Goals and were adopted by all member countries of the United Nations on 25 September, 2015. These goals cover a wide range of indicators and activities meant to sustainably end poverty and spread prosperity across the world. Indonesia adopted these goals and as a nation prioritized eliminating poverty, inequality, and the promotion of peace, justice, strong institutions, and climate action.

While the Sustainable Development Goals were created after the Rimba Raya project had already been started, many of the project activities were designed with the overarching goal of sustainable development and already support most of these goals. In fact, as shown in the table below (Table 3), all the development goals are supported by at least one project activity. Most of these project activities have made progress during this monitoring period.

Sustainable Development Goal	Activities Supporting Goal	Relevant MIR Sections
Eradicating Poverty: End poverty by 2030 through the targeting of the most vulnerable people.	Employment opportunities, community based agro-forestry, providing additional credit, supplying solar lighting, and conserving water by reducing the expansion of palm oil.	1.1, 4.1.1, 4.1.2, 4.4
Zero Hunger: End all forms of hunger and malnutrition by 2030.	In addition to the activities listed above for eradicating poverty, additional project activities directly address food insecurity. These include fire suppression and education, soil enrichment, crop diversification, and groups dedicated to sustainable fisheries.	1.1, 3.3, 4.1.1, 4.1.2, 4.4
Good Health and Well-Being: Achieve universal health coverage, access to safe and affordable medicines and vaccines, and eradicate global epidemics.	Protection of plant species with potential medical benefits (see Goal 6 in section 4.1.2), protecting water quality, expanding access to clean water with water filters, and distribution of cook stoves. Also efforts have been made to begin building a floating health clinic.	1.1, 2.2.1, 3.3.1, 4.1.2, 4.2.1, 4.4.2

Quality Education: Ensure inclusive and quality education for all and promote lifelong learning.	Educational programs for all ages on a range of topics including fire management, health issues, and water safety. Distribution of solar lighting has allowed for expanded educational opportunities for children both at school and home. Preventing the expansion of oil palm plantations ensures children will not be forced to skip school to work on them.	1.1, 4.1.1, 4.1.2
Gender Equality: Achieve gender equality and empower all women and girls.	Women frequently work the more dangerous jobs on palm oil plantations for little to no pay. With the project, women are being employed through project-related activities, receiving money from the micro-credit program, introducing their handicrafts to new markets, and have taken part in programs and meetings that increase their social capital.	1.1, 4.1.1, 4.1.2
Clean Water and Sanitation: Ensure access to water and sanitation for all.	The project has resulted in the distribution of a large number of water filters, protected water sources by preventing the expansion of oil palm and planting buffers, and created a working group dedicated to sustainable fisheries. Long-term, educational programs are focused on protecting water sources so that they can adapt to climate change.	1.1, 2.2.1, 3.3, 4.1.3, 4.4.2
Affordable and Clean Energy: Ensure access to affordable, reliable, sustainable and modern energy for all.	Distributed cook stoves that are fuel efficient and emit less than older stoves. To support this, there has been an expansion of biochar briquettes production, which replaces older inefficient sources with a local resource.	1.1, 2.2.1, 4.1.1
Decent Work and Economic Growth: Promote inclusive and sustainable economic growth, employment and decent work for all.	Project directly employs local community members. There are also opportunities to receive micro-credits and access new markets to sell goods. Additionally, while converting the project area to palm oil plantation would have provided some employment opportunities to local members, these jobs frequently go to people outside local communities and do not pay well compared to the difficulty of the work.	1.1, 2.2.1 4.1.2
Industry, Innovation, and Infrastructure: Build resilient infrastructure, promote sustainable industrialization and foster innovation.	The project hasn't just prevented the expansion of palm oil, an industry that causes large amounts of damage to the environment, but has encouraged innovation to new markets, such as cash crops, recyclable handicrafts, and encouraging chicken egg and meat working groups.	1.1, 2.2.1, 4.1.3
Reduced Inequalities: Within and among countries.	Project is providing equal opportunity employment for women and other minority groups, and employs local people instead of immigrants from outside the area. Project activities have been implemented with a goal of sustainability which will ensure benefactors of the project will not fall behind citizens of other countries.	1.1, 2.2.7, 4.1.1
Sustainable Cities and Communities: Make them inclusive, safe, resilient, and sustainable.	While there are no larger urban areas within the project area and surrounding region, this is a co-benefit of many of the other project activities and the goals they support. The project is providing equitable opportunities, increasing the resilience to climate change through buffer zones, and diversifying economic opportunities.	1.1, 2.4.2, 2.4.3, 4.3.1, 4.3.2, 4.4.2
Responsible Consumption	The project has encouraged economic diversification	1.1,

and Production: Ensure sustainable consumption and production patterns.	through the creation of a women's working group that focuses on making souveniers from recycled garbage. Forests are only allowed to be harvested in limited amounts for local consumption.	2.2.1, 2.4.3, 5.1.2, 5.2.1
Climate Action: Take urgent action to combat climate change and its impacts.	On October 31, 2016, Indonesia ratified the Paris Agreement, committing the country to emissions reductions. Deforestation is easily the largest source of emissions within the country, and reducing these emissions within the project area is the primary goal of this project. Activities such as increased monitoring, fire prevention, and economic diversification exist to support this goal.	1.1, 2.2, 3.1, 3.2.4, 4.1
Life Below Water: Conserve and sustainably use the oceans, seas, and marine resources.	A sustainable fishery has been created as a result of working group created in conjunction with World Education. Additionally, buffer zones have been created especially within riparian zones, which reduce the amount of peat drainage into the Seruyan River and protect its water quality, which prevents this pollution from reaching the ocean.	1.1, 3.2.1, 4.1.3, 4.2.1, 5.1.2
Life on Land: Sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss.	Protecting the forest within the project area is the primary goal of the Rimba Raya project. As an additional co-benefit, this forest is the habitat for a high amount of biodiversity, and protecting this habitat is the best way to protect these species. Finally, as part of the project activities, degraded areas are being replanted as buffer zones.	1.1, 2.2 5.1, 5.2,
Peace, Justice, and Strong Institutions: Promote just, peaceful, and inclusive societies.	InfiniteEarth has supported the formation of stronger institutions through the creation of working groups that are inclusive of women and indigenous groups. These working groups have been created in conjunction with project partners World Education and OFI, ensuring these decentralized groups have sufficient institutional support.	1.1, 2.2.1 2.4, 4.1
Partnership for the Goals: Revitalize the global partnership for sustainable development.	Throughout development of this project, InfiniteEarth has worked with various levels of society. In the public sector, it reached agreement with the national government to claim the carbon rights for the area. It also received concessions from the private sector when PT Best agreed to hand over control of some of the property in the project area to the Rimba Raya project. Finally, the project proponent's partners in the project are civil societies and NGOs with a long history of conservation and sustainable development.	1.1, 2.1.4, 2.2.7, Non-Permanence Risk-Report

Table 3: All UN Sustainable Development Goals and Their Supporting Activities

As the project has moved forward, it has re-evaluated its goals and subsequent project activities with the Sustainable Development Goals adopted by Indonesia. When necessary, project activities have been altered or created in order to support the accomplishment of these development goals.

2.2 Project Implementation Status

2.2.1 Implementation Schedule (G3.4).

The project has updated the Project Implementation Schedule (Table 4) to include both progress that has been made on previous activities, as well as new activities that were identified through the community Theory of Change exercise that was conducted by Rimba Raya Staff. The Theory of Change model is described in more detail in section 4.

Project Phase	Event / Milestone	Activity Description / Relevancy	Start Date	Finish Date	Status	Responsible Party	Progress Remarks
Feasibility study	Meeting with Orangutan Foundation Intl.	Determine synergy between orangutan conservation objectives and avoided deforestation	20-Mar-2008	21-Mar-2008	Complete	Todd Lemons	V
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	V
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	V
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	V

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	V
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	V
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	V
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	V
Feasibility study	Commission "Desk Top Study"	Contract Forest Carbon to conduct a Desk Top Study of the Project area	1-Jun-2008	15-Aug-2008	Complete	Forest Carbon	V
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	15-Sep-2008	1-Oct-2008	Complete	Todd Lemons / Promethe us	V

		proposed activities					
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	V
Establishment of Rimba Raya Reserve	Establishment of offices	Administrative offices established in Jakarta and Pangkalan Bun and field office established in Seruyan	1-Oct-2008	31-Dec-2014	Started	Infinite-Earth	Completed and in by end of 2014 has moved to Sampit plus have 3 unit offices on the site.
Establishment of Rimba Raya Reserve	Project Design	Design & Development of the Rimba Raya REDD Project	1-Oct-2008	15-Mar-2009	Complete	Infinite-Earth	V
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	V
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	31-Nov-2008	Complete	Todd Lemons / Prometheus	V
Establishment of Rimba Raya Reserve	Biodiversity Study	Commission Biodiversity Study of project area	1-Nov-2008	15-Jan-2009	Complete	Daemeter	V
Establishment of Rimba Raya Reserve	Community Assessment	Commission Assessment for all communities in the project area to determine land tenure	1-Dec-2008	1-Feb-2009	Complete	Daemeter	V

		analysis, socio-economic status and needs, etc					
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	Complete	Todd Lemons /Dr. Galdikas	V
Extension of OFI Activities	Construction of orangutan release centers & feeding platform	Four release stations will be built inside the project area	1-Dec-2013	31-Mar-2017	Pending in planning	Rimba Raya / OFI	1 release station has been built in 2017 and completed by beginning of Feb 2017, located in Tatah Slamet, Baung village, Danau Sembuluh Sub-District, Seruyan District, Central Kalimantan – Rimba Raya area. OFI has released 10 orangutans in Feb 2017 and 9 orangutans in May 2017. Note: report done
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	V
Development of Social Buffer	Daemeter Social Survey	Daemeter field team visits villages in the Project Zone to gather	23-Dec-2008	28-Dec-2008	Complete	Daemeter	V

		info and elicit opinions on proposed project activities					
Establishment of Rimba Raya Reserve	Agreement with carbon buyers	Contract for the purchase of REDD credits	15-Feb-2009	15-Jun-2010	Complete	Infinite-Earth	V
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	V
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	V
Establishment of Rimba Raya Reserve	Fire Plan	Design and Implementation of comprehensive fire prevention and response plan	1-May-2009	1-Jun-2010	Complete	Marc Nicolas	V
Establishment of Rimba Raya Reserve	PDD Pre-validation	PDD submitted for pre-validation review	1-May-2009	31-May-2009	Complete	Rainforest Alliance	V
Establishment of Rimba Raya Reserve	PDD Translation and Dissemination	PDD translated into Indonesian and distributed to all stakeholders for the CCB public comment period	1-May-2009	31-May-2009	Complete	Rini Firdaus / OFI / Rimba Raya	V
Establishment of Rimba Raya	Minister's Letter of	Concession approved contingent on	1-Jun-2009	30-Jun-2009	Complete	IE Mgt Team /	V

Reserve	Recommendation	compliance with administrative steps				Prometheus	
Establishment of Rimba Raya Reserve	Monitoring Plan	Design & Development of Monitoring Plan	1-Jun-2009	15-Jan-2009	Complete	Forest Carbon / Daemeter	V
Establishment of Rimba Raya Reserve	Daemeter Phase 2 Biodiversity and Community Assessments	CCB validation and verification	1-Jun-2009	15-Jan-2010	Complete	Daemeter	V
Establishment of Rimba Raya Reserve	CCB Validation	PDD posted to CCB website and project validation commences, triggering public comment period	1-Jun-2009	15-Jun-2010	Complete	SCS	V
Establishment of Rimba Raya Reserve	1st and Second Validation of Methodology	Receive 1st validation of methodology, receive 2nd validation	1-Jun-2009	07-Sep-2011	Complete	Bureau Veritas,	V
Development of Social Buffer	Public comment meetings	Meetings in Project Zone communities to describe project and elicit comments	1-Jun-2009	15-May - 2010	Complete	Rimba Raya/ OFI	V
Extension of OFI Activities	Release of rehabilitated orangutans	Coordinated release of 300 rehabilitated orangutans into the project area	1-Jun-2012	31-Dec-2021	Pending In Planning	Rimba Raya / OFI	Released 10 orangutans in Feb 2017 and 9 orangutans in May 2017 in Rimba Raya area.
Establishment of Rimba Raya Reserve	Environmental Impact Assessment	Conduct Environmental & Social Impact Study	1-Jan- 2010	15-Apr-2010	Complete	Focus Consulting	V

		per Dept of Forestry Regulations for final approval					
Development of Social Buffer	Community consultations	Series of meetings with Project Zone communities to elaborate and prioritize social programs	1-Aug-2009	31-May - 2010	Complete	Rimba Raya	V
Development of Social Buffer	Community consultations	Initial (1 of 2) Public Comment Period	1-May-2010	31-May - 2010	Complete	RRC & World Education	V
Development of Social Buffer	Community consultations	Formal CCBA Public Comment Period	1-Sep-2010	30-Sep - 2010	Complete	RRC & World Education	V
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	Feb-2013	Complete	IE Mgt Team / Rimba Raya	V
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	31-Dec-2014	Started	Rimba Raya / OFI	On progress – Rimba Raya has made village agreement where both parties (Rimba Raya and certain village) agree on some points supporting conservation and restoration programs performed by Rimba Raya. Some do and don't are included in the village. So far, there are

							9 villages have signed the agreement. Note: report done.
Establishment of Rimba Raya Reserve	VCS Verification	VCS verification commences	01-Jun-2010	April 2013	Compete	SCS	V
Execution of Rimba Raya Operational Plan	Guard Posts	20 guard posts built at strategic locations across the Reserve	1-Jan-2014	1-Jan-2019	Pending in planning	Infinite-Earth / OFI / Rimba Raya	3 guard posts have been built in: 1. Natai – Kopi (North Unit) 2. Sigintung Area – Muara Dua (Central Unit) 3. Kudung - (South Unit) Note: it is in the report no. 8
Execution of Rimba Raya Operational Plan	Hiring and training of new personnel	Field manager, Chief Reserve warden, and 35 new guards hired and trained	1-Jan-2013	1-Jan-2019	Started	Infinite-Earth / OFI / Rimba Raya	Currently Rimba Ray has: 1. 3 Unit Manager – located on the site 2. 2 Assistant Unit Manager and 1 unit comdev coordinator 3. 15 – 21 field staff/unit, including comdev staff. At the end of June 30, 2015?

							• In the Northern Unit 21 • In the Central Unit 20 • In the Southern Unit 13 • Sampit Staff 14 + Jkt 9, in total 77 staff At the end of June 30, 2016 • In the Northern Unit 19 • In the Central Unit 21 • In the Southern Unit 18 • Sampit Staff 13 + Jkt 8, in total 80 staff At the end of June 30, 2017 • In the Northern Unit 16 • In the Central Unit 21 • In the Southern Unit 15 • Sampit Staff 14 + Jkt 8, in total 74 staff
Execution of Rimba Raya Operational Plan	Hiring and training of fire brigade	Fire chief engaged and fire brigade hired and trained	1-June-2010	31-Dec-2015	Started	Infinite-Earth /Rimba Raya	V
Co-Management	Execution of Co-	Become an additional party to the existing	1-Jun-2010	Aug-2013	Complete	Rimba Raya /	V

of Tanjung Puting	Management Agreement with TPNP Authority	and historical co-management agreement between OFI and TPNP				OFI	
Extension of OFI Activities	Construction of orangutan remote feeding platforms	Four supplemental feeding platforms will be built inside the project area	1-Jun-2014	31-Dec-2016	Pending in planning	Infinite-Earth / OFI / Rimba Raya	1 feeding platform has been built and completed by beginning of Feb 2017. Location in Tatah Slamet – Baung village. Note: report done
Outreach and Education	Biotracker development	Design and development of proprietary Bio tracker implant	1-Jun-2009	15-Jun -2014	Started	Infinite-Earth / SirTrack	There was an idea to make bio cricket from cows/goats but still in idea.
Development of Social Buffer	Annual grants to local communities for education.	Grants are given to communities after consultation with World Education.	1-Aug-2013	31-Dec-2039	Started	Infinite-Earth	Continued development of stakeholder engagement in various project activities such as community appraisals and participatory mapping
Co-Management of Tanjung Puting	Commencement of annual grants to TPNP	Grants to fund TPNP conservation activities	1-Jan-2014	31-Dec-2039	Started	Infinite-Earth	Continued correspondence and co-management with TPNP staff including capacity building exercises, training, shared fire

							brigade and monitoring activities
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-Aug-2013	31-Dec-2039	Started	Rimba Raya / OFI	We never get training from the military or from police. We get some training for firefighting 2x in 2015 and 2016. Note: report done
Extension of OFI Activities	Commencement of annual grants to OFI	Grants to fund OFI orangutan conservation and rehabilitation activities	1-Jun-2011	31-Dec-2039	Started	Infinite-Earth	We provide each month IDR 120jt for OFI. Note: report done.
Development of Social Buffer	Community centers & libraries & "One Laptop per Child"	2-3 community centers & libraries will be built, 1 in Baung and 1 in Muara Dua	1-Jun-2014	31-Dec-2015	Pending in planning	Rimba Raya / OFI	In 2016 - 2 village libraries have been developed, 1 in Ulak Batu and 1 in Muara Dua. Plan in 2017 – 2018 – 2 more village libraries. Note: report done
Development of Social Buffer	Water filtration systems	Development of community based clean filtration system	1-Sept-2013	15-Mar-2014	Started	Rimba Raya	V
Development of Social Buffer	Fuel efficient clean-tech sustainable	Finance and distribution of Fuel efficient clean-tech	1-Sept-2013	31-Jul-2014	Started	Rimba Raya	99 Cook stoves have been distributed in Oct

	cook stoves & biochar production	cook stoves and biochar production technology to each household					2013. The acceptance was not to satisfy as the villagers thought that the stove was not too big so it wasn't too efficient to cook as they had to refill several times to cook their meal. They prefer to have gas stove. Note: report done
Development of Social Buffer	Aquaponics program	Fund technical consultants on creating high yield, small footprint aquaponics greenhouses	1-Jun-2014	31-Dec-2015	Pending in planning	Rimba Raya	Experimental project for hydroponics has been started by Hartono (Rimba Raya staff – in Baung) with not too satisfy result, however we obtained some inputs and recommendation for the next bigger scale experiment.
Outreach and Education	Orangutan study	Design and setup of orangutan tracking study	15-Jun-2009	30-Jun-2014	Started	Rimba Raya / OFI	Orangutan's fauna and nest monitoring has been included in the Rapid assessment activity.
Establishment of Rimba Raya Reserve	CCB Verification	Receive CCB Gold Validation	15-Mar-2009	30-Nov-2014	Started	IE/RR	IE
Development	Early	Begin stocking	1-Oct-2014	31-Mar-	Pending in	Rimba	

of Social Buffer	Childhood Education & Development (ECED)	materials and hiring trainer / instructors for the ECED programs at the 2-3 community centers		2016	planning	Raya / OFI / World Education	Develop village library – providing children books. Note: report PEDAL.
Outreach and Education	Interactive Educational Platform	Creation of an interactive educational platform around the content of the research study	1-Oct-2014	31-Dec-2015	Started	Rimba Raya / Infinite-Earth	Implementation of Farmer Field School in order to increase capacity of local communities – including shrimp paste and chicken/egg production
Execution of Rimba Raya Operational Plan	Implementation of Monitoring Plan	Execution of Monitoring Plan	1-Jun-2013	31-Dec-2039	Started	OFI / Rimba Raya	Rimba Raya has developed field monitoring system by: a) Rapid assessment b) Fire Monitoring, including hot spots c) Forest Patrol, including illegal logging/hunting activities d) Subsidence Pole e) Participatory mapping f) Forest inventory with 1% intensity g) Replanting on damaged area (rehabilitation program) Plus we have been conducting community development program –

							creating/developing some alternative livelihoods in order to minimize/reduce/stop villagers entering the forest - Rimba Raya area (for commercial economy activity).
Development of Social Buffer	Immunization Program	Launch disease prevention & immunization program	1-Sep-2013	31-Dec-2039	Started	Rimba Raya/ Health In Harmony	Will be synchronized in Floating clinic program.
Execution of Rimba Raya Operational Plan	Construction of fire towers	5 fire towers built at strategic locations across the Reserve	15-Mar-2014	15-Mar-2019	Started	Rimba Raya	On progress
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-2014	31-Dec-2039	Pending in planning	Infinite-Earth	Rimba Raya has developed 1 local cooperative Itah.
Development of Social Buffer	Health Program	Provide health care in return for help conserving forest area	1-Sep-2013	31-Dec-2039	Started	Rimba Raya/ Health In Harmony	Rimba Raya shall provide better health service for the villagers by Floating Clinic program. Note: report done
Execution of Rimba Raya	Phase I-III Rehabilitation	Rehabilitation of degraded habitat via	1-Aug-2013	31-Dec-2039	Started	Rimba Raya	Replanting some multi

Operational Plan	of degraded habitat	a multi-story mixed indigenous species natural forest & community based cash crop agro-forestry approach					fruits tree in the replanting ares. Cash crop: pineapple and djengkol.
Outreach and Education	Completed building of chicken farm in Baung	A chicken farm is operational for egg and meat production within the village of Baung	2016	2017	Completed	Indah Berseri and Putri Baung Bakena	Chicken farm is operational and generating income for members and a protein source for local communities.
Outreach and Education	Forest tree nursery development	Replanting activities are required in the area, which requires educational materials for villagers to use to develop a nursery in some villages.	2014	2017	Ongoing	Muara Dua and Ulak Batu	Rimba Raya is preparing curriculum and materials, along with funds for the procurement of demonstration plots. Equipment and participatory monitoring are also being evaluated.
Outreach and Education	Pilot project for fish cultivation within floating cages	10 fish ponds of 3 x 2 m have been installed for production of the patin fish. Rimba Raya has helped with the implementation of studies looking at the most effective development methods. These fish will add alternative protein and income sources for participants.	2014	2017	Ongoing	Palingkau	Rimba Raya helped the fishermen procure the cages, along with help from the Marine and Fisheries Department. They've also been part of the implementation process of the case study underway attempting to maximize yields through experimentation and leading discussions.

Outreach and Education	Continued development of a women's working group for packaging shrimp paste	This is an effort to keep the price of shrimp paste stable in the area through a women's group in charge of packaging the paste for later use.	2015	2017	Ongoing	Sungai Perlu	This project has been implemented with support from TPNP and the Seruyan District, through the women's working group Terasi Zu-Per. Production of the paste has gone up every year with support from Rimba Raya in the form of capital, equipment, technical assistance, and marketing.
Outreach and Education	Creation of a working group focused on dried fish production	The Muara Dua community is well known in the region for their ability to produce a high quality product sustainably. Rimba Raya created the Tampudau working group to focus on expanding this production	July 2016	2017	Started	Muara Dua	This is a newly formed working group, which started in July 2016, but didn't focus on strengthening their institution until early 2017. The group is still in the early stages of development, and Rimba Raya is providing support in the form of organizational management.

Table 4: Project Implementation Schedule for the Rimba Raya Project

The primary project activity has been to avoid the conversion of tropical peat swamp forest to oil palm plantations. Operationally this primary activity is achieved through the implementation of the following core project activities. Any progress made during this monitoring period is included in their descriptions.

1. **Establishment of the Rimba Raya Reserve**. The primary project activity has been the establishment of the Rimba Raya Reserve, a privately-funded protected area along the eastern boundary of Tanjung Puting National Park (TPNP). The management plan includes the creation of a series of guard towers, a fire response plan and fire brigade, and a comprehensive monitoring system. These measures have helped to ensure the permanence of project area carbon stocks, biodiversity and the territorial integrity of TPNP. In addition, project proponents have funded significant enrichment and rehabilitation work inside the project area and its buffer zone, increasing carbon stocks, biodiversity and sustainable community involvement.

2. **Guard post network**. OFI has been instrumental in funding and building a small network of guard posts along the perimeter of TPNP over the past two decades, with the bulk of these posts located along the park boundaries to the north and west of the project area. The Rimba Raya project has extended and continued to extend this network of guard posts to create comprehensive observation and communication coverage. The network of guards and guard posts has provided protection from illegal logging, poaching, and encroachment by oil palm plantations.

Rimba Raya has hired local guards in the form of permanent field crews that are responsible for patrolling relating to forest protection and this has been done regularly since September 2014. During this monitoring period, three new guard posts have been built.

3. **Fire Plan**. Fires have periodically swept through the project area and the park during dry periods. The Rimba Raya project is creating a fire response system, including training and equipping a fire brigade and developing a fire response plan for the reserve in conjunction with guard towers and stations. To reduce the impact of fire, fire towers, fire brigade and equipment suitable for peat swamp firefighting are being established in the project area.

During the most recent monitoring period, full crews have been established in all 3 field units, and all have been provided with basic firefighting, safety training and have also been equipped with appropriate pump kits (pumps, hose, nozzles, hand tools). During the roughly 6 month fire season, these permanent crews are supplemented with 3 full (11 person) seasonal crews that assist in conducting the routine field work, monitoring and measuring, building of guard posts and fire towers and other such tasks so the permanent crews can focus almost exclusively on fire prevention and suppression.

4. **Monitoring Plan**. A monitoring plan has been developed to collect relevant climate, community, and biodiversity data. Combining early warning, ground truthing and remote sensing, the monitoring plan tracks key indicators to report on the integrity of the reserve's carbon stocks and biodiversity and to allow project proponents to adapt the reserve management plan to changing

conditions. Crews have been established in all 3 field units to conduct patrols necessary to provide this early warning system and allow the field staff to take earlier action to conditions that warrant such. During this monitoring period, various monitoring operations have continued and employee refreshment training courses have occurred.

5. **Enrichment and Rehabilitation**. The project proponents have committed to undertaking significant enrichment and rehabilitation work inside the Project area. Each year, the project proponents will carry out enrichment activity, planting seedlings of native dipterocarp and other appropriate tree species in areas with an insufficient inventory of young trees. In addition, significant rehabilitation of non-forested areas (including shrubland, grassland, and deforested areas), is planned. In particular the planting of native species such as jabon, binuang, and makaranga that thrive in exposed and degraded conditions. By the conclusion of the project, significant stretches of forest will have been restored to their natural state, increasing carbon stocks in the Project area and providing additional habitat, thereby strengthening the physical buffer protecting TPNP.

During this monitoring period, nearly 180,000 seedlings, consisting of more than 20 species, were planted. All seedlings were sourced from nurseries run by the project communities. Monitoring of forest growth from previous plantings occurs and efforts are made to identify inter-planting needs when appropriate.

6. **Indigenous Species, Cash Crop, Community-based Agro-forestry Program**. As part of its reforestation effort, Rimba Raya has launched a community-based, cash crop agro-forestry project based on multi-story/multi-crop plantations of native species cash crops, including fruit, nut, spice, and rubber trees and jelutung, inter-planted with rare species (such as ramin and meranti) in a matrix of secondary forest regrowth.

Two nurseries have been previously established in villages within the concession area, one in Ulak Batu which now has a permanent nursery site with an irrigation system, and one in Muara Dua, where a permanent site has yet to be identified and instead the seedlings continue to be grown and maintained by individual families within their property. Rimba Raya is working with the local community members to identify a broad mix of income and subsistence wood producing species that are grown in the nurseries until replanting and then purchased from the villages. These trees are planted by the families in the villages with the assistance of Rimba Raya staff in individual plots so that each family can maintain them over time and reap the harvests of any products once they grow to the required age. These include species such as jelatung and rubber for sap, ramin, meranti and ulin for village construction, and various fruit trees that can be harvested for subsistence or sale to OFI for feeding orangutan or to the oil palm companies for fresh fruit for their staff.

In 2015 the project has ramped up a more intensive agroforestry program focusing on short, medium and long-term cash products, especially 'niche' products such as essential oils and other non-timber forest products like gaharu (agarwood), which bring higher prices and are becoming more difficult to find. Additionally, work began in assisting villagers with participatory mapping, which has helped identify areas to be targeted by these activities.

7. **Funding of OFI activities**. A portion of the revenues from the sale of the project's carbon credits will be used to fund OFI's on-going activities; including new programs for reforestation of critical orangutan habitats and acquisition of viable habitat that does not currently meet REDD project requirements for additionality. In addition, project proponents are building new orangutan release centers and feeding platforms at strategic locations inside the Project area. Working with project proponents, OFI uses the release centers to reintroduce as many as 300 orangutan from their orangutan Care Center and Quarantine (OCCQ) Rehabilitation Center near Pangkalan Bun, back into the wild, utilizing the reserve as a staging ground for their migration into the park.

8. **Co-management of Tanjung Puting National Park**. The TPNP Authority has the responsibility to protect over 400,000 ha of national park. Its staffing levels do not correspond to the level of pressure by the agent of deforestation. The mere presence of the Rimba Raya project along the park's exposed eastern flank will significantly support the authority to maintain the boundary. The Rimba Raya Conservation Project is committed to developing a for-profit conservation model for underfunded national parks. Under this model the project proponent works to strengthen the co-management agreement already in existence between TNPN and OFI. The project proponent has also supported park personnel training, capacity-building opportunities, improved equipment for monitoring and communication, and the reserve's fire brigade.

9. **Development of Social Buffer**. An essential element of the Rimba Raya project is the engagement of all stakeholders in the Project zone in order to create a social buffer to the park and Project area, thereby alleviating many of the external pressures that drive deforestation. The project proponents have created a process framework designed to disseminate information about project development and implementation, support community participation in all aspects of the project, and offer opportunities for capacity-building. To create an effective social buffer, project proponents believe that a comprehensive approach to socio-economic development must be undertaken with the objective of addressing the root causes of community-based deforestation – namely poverty, hunger, disease, lack of adequate shelter, and exclusion. To that end, a slate of programs has been developed based on data from an initial social survey in the Project zone and with reference to the UN Millennium Development Goals for Indonesia.

10. **Community Centers**. Following the successful example of OFI with communities in the park's western region, project proponents built community centers in strategically selected villages inside the Project zone to act as a soft interface between the Project and the communities. The community centers offer facilities for park and project staff as well as for community organizations, and they supply news and radio communication facilities, libraries, and social and agricultural training programs. During this monitoring period, two community centers were progressing in their construction and working on adding a library component. These are in villages of Ulak Batu and Muara Dua.

11. **Agriculture & Aquaculture Productivity.** The Rimba Raya project has extended World Education's ongoing programs for food security, access to government services, and capacity

building within the project zone. By helping local households meet their food needs utilizing land already under cultivation and by educating them about their political rights, the Rimba Raya project has eliminated many of the incentives driving illegal logging and the unnecessary conversion of forest to agricultural land. Agriculture activities have ranged from Farmer Field Schools to teach better agricultural practices, planting plots in various vegetables to demonstration plots. Crops covered to date include peppers, eggplants, rice, and various other vegetables capable of being supported by the various soil types present in each village. During this monitoring period, a successful working group has been established for salt fish.

12. **Community Multi-crop Agro-Forestry**. In keeping with its commitments to reforesting degraded lands within the Rimba Raya Reserve, the project proponent has implemented a community-based agro-forestry program for native cash-crop species.

Two nurseries have been developed; a permanent site in Ulak Batu and individual garden sites in Muara Dua where Rimba Raya purchases seedlings. The seedlings are planted by the villages in individual family plots, harvested by the community members with the commodities harvested to be used for subsistence, sold to Rimba Raya or other others. Multiple species have been used to provide wood for construction materials, fruit for consumption and sale, and sap producing trees such as rubber and jelutung for income production. During this monitoring period, 0.6 hectares of pineapple and djengkol plots have been established in Ulak Batu. Additional discussions continue to occur with a major international company that provides spa products on developing a program for plants providing essential oils, building a refinery in one of the villages for processing and then this company purchasing from the community members all available oils regardless of grade.

13. **Clean Water Systems**. Recent years have seen increased flooding in the Seruyan River watershed, and Project zone communities have had trouble gaining access to clean water resources. Based on community surveys intended to help project proponents prioritize social programs, it has been determined that clean water is one of the largest priorities for those living in the communities. To date, 1,872 water filters have been distributed to 9 of the villages.

14. **Fuel-Efficient Stoves**. The Rimba Raya project proponents have distributed 99 clean cook stoves among villages in the project zone. These inexpensive, well-designed stoves significantly reduce the amount of fuel wood required to cook and the amount of smoke generated during cooking. The project proponent plans to provide every family bordering the Project area with a stove. The project proponent has continued to gather feedback and suggestions from community members concerning the cook stoves and their functionality.

15. **Biochar Briquettes Production**. Traditionally, in most rural settings, people use biomass material to cook with and to heat their homes. The biomass material used is either raw or in the form of processed charcoal. This form of energy source, while being widely accessible, is inefficient, degrading to the environment and a health hazard. The production of biochar briquettes presents an additional opportunity for community based enterprise through sustainable use of local resources. No activity has been started on this program to date.

16. **Low Maintenance - Small Scale Solar Lighting**. The lack of electricity in the communities bordering the Project area affects their lifestyle and the economy. During this monitoring period, 1,671 solar lanterns have been distributed among 9 villages. 11 units of 60 watt solar panels have been installed along with 11 solar generator units operating at 1 kW.

17. **Micro-Credit**. Microcredit is the extension of very small loans to people who otherwise have not access to finance. These individuals lack collateral, steady employment, and a verifiable credit history and therefore cannot meet even the most minimal qualifications to gain access to traditional credit. During this monitoring period, progress has been made in securing financial support and creating working groups for shrimp paste production and chicken meat/egg production.

18. **Sustainable Health Care**. The project proponent plans to develop a health care system designed specifically to meet the needs of Project zone communities in collaboration with Health in Harmony (HIH), a Western Kalimantan-based health care program that integrates high quality, affordable health care with strategies to protect threatened forests. During this monitoring period, progress has continued in developing a health care plan concept and distributing water filters. Additionally, a clean water system has been installed in the village of Baung.

19. **Floating Clinic.** Project proponents have continued the arrangement for the construction, outfitting, and deployment of a floating medical clinic. In lieu of community clinics, a floating clinic was chosen for its mobility and the resulting ability to deliver medical services up and down the Seruyan River, effectively servicing all of the communities in the Project zone.

The only activity on this program so far has been initial discussions with the Indonesia medical profession about how we might staff such a floating clinic once the funding is available to build and put it into operation. One avenue being explored further is to team with medical schools within Indonesia that provide senior students that would serve in the clinic for specific periods of time as part of their internship at no or low cost to the program and no cost to the community members. During this monitoring period, planning and development for the mobile clinic has continued. Specifically, the budget has been updated and construction of the boat itself made a lot of progress.

20. **Capacity Building Programs**. During this monitoring period, capacity building efforts have been focused towards women's working groups. Women's working groups have been established and finances secured for shrimp paste and chicken egg/meat production. Likewise, a handicraft working group has been created, consisting of women who create souvenirs from recycled garbage.

21. **Subsidence Measurements.** Subsidence measurements detect changes in peat surface height at certain times in order to determine peat volume versus water content. Throughout this monitoring period, several measurement stations were installed and data was collected periodically. Employees were hired and trained accordingly.

2.2.2 Methodology Deviations

There were only two methodology deviations during this monitoring period. The first was performing only one complete landcover classification for 2017 instead of completing a landcover classification annually. This is an acceptable deviation under VCS Standards v3.7 since it is only a deviation regarding monitoring or measurement. This was conservatively completed, especially for the identification of burn areas, through the use of additional satellite imagery from the other years of the monitoring period to insure that no areas were missed.

The second deviation was the use of community engagement and field monitoring instead of aerial imagery to detect logging gaps. Again, this is an acceptable deviation under VCS Standards v3.7 for the same reasons and was done due to the high degree of difficulty in obtaining annual high resolution imagery and then actually observing the location of logging gaps. Field crews were instructed to make note of any signs of logging they observed within the project area and community members were engaged with Rimba Raya staff, informing them of areas where logging was observed. When notice of this logging was received, Rimba Raya field workers traveled to the logging gaps and documented and verified the existence of these gaps while taking measurements of felled trees.

2.2.3 Minor Changes to Project Description (*Rules* 3.5.6)

There have been some minor changes changes to the project regarding the villages included in it. Six villages in the northern region, Bahaur, Pairing Raya, Parang Batang, Tanjung Hanau, Banua Usang and Parent are no longer part of Rimba Raya since the Decree issued by MOEF in 2013 cut out the upper part of the working area. The project was also expanded into new villages from the Seruyan District. The Rimba Raya project added Sungai Perlu in 2014, Pematang Limau in 2015 and Kuala Pembuang 1, Kuala Pembuang 2, Sungai Undang and Persil Raya in 2016. So in total, up to this year there are 14 villages under partnership with Rimba Raya.

2.2.4 Project Description Deviations (*Rules* 3.5.7 – 3.5.10)

2.2.4.1 Deviations for this Monitoring Period

First Deviation	
Source:	Project Description Section 3.3 (Data & Parameters Monitored) and Section 4.5 (GHG Emission Reductions)
Criteria and Procedures:	Update of parameters used in quantifying GHG emissions and reductions, specifically global warming potentials (GWP) for N_20 and CH_4.
Relation to Monitoring or Measurement:	This procedure is related to measurement.
Timeline for Deviation	June 22, 2014 – crediting period end date, or availability of updated IPCC GWP values
Requested Deviation:	Update GWP values for N_20 and CH_4 for this monitoring period in both the baseline and project accounting models to values found in the 2007 IPCC 4th Assessment Report (IPCC AR4) in order to follow the VCS Standard v3.7.
Justification:	Section 17 of VM004 allows for updates to data used in modeling calculations as better data becomes available, and if such changes are expected to increase the accuracy of modeling measurements. This deviation does not affect the applicability of the

	methodology, additionality, or the appropriateness of the baseline scenario.
Quantification Impact:	Changes to these factors will impact overall GHG emissions from biomass burning and peat burning in both the baseline and project scenarios. Baseline emissions will only be updated from years 6 and on, as years 1-5 have already been credited during previous monitoring periods.

Second Deviation	
Source:	Project Description Section 3.3, VM0004 Methodology Section 19.2.2
Criteria and Procedures:	Update the ex-post peat burn depth value in the accounting from literature values that determine peat burn depth based on frequency of fire.
Relation to Monitoring or Measurement:	This procedure is related to measurement. Updating the peat burn depth based on more recent literature values, confirmed with field measurements, increases the accuracy and precision of emissions due to peat burning.
Timeline for Deviation	June 22, 2014 – crediting period end date, or availability of improved field measurements
Requested Deviation:	Instead of using a peat burn depth of 0.34 m for ex-post accounting, the project will use the value of 0.18 m, 0.11 m, and 0.043 m for the first, second, and third fires respectively. The conservativeness of these values was confirmed with field measurements collected in burned areas within the project area, which ranged from 0.005 – 0.03 m in depths. The project will apply these burn depth values to the 2014-2017 burn area based on the historical frequency of fire within the burn area. The historical frequency of fire will be determined by examining the fires within the CAA from 2000-2014.
Justification:	The methodology allows for the use of literature values that are confirmed by field measurements in the project accounting in section 19.2.2. Due to the nature of fires in peat, often times the burn depths decrease as an area experiences multiple burns. Two studies, Hooijer et al. 2014 and Konecny et al. 2015 found decreasing burn depths correlated with the frequency of fire within the study area. The CAA has a history of fire that predates the project start date, which ultimately affects the burn depths that occur during fires within different parts of the CAA. The Hooijer and Konecny studies looked at fires within a study area over a period of 20 years. The project conservatively reviewed the frequency of fire within the CAA for a period of 14 years using MODIS burn area data in order to ensure that the burn depths were applicable across the same timeline. The project is applying literature values that have been confirmed to be conservative using field studies as required by the methodology. The project is also conservatively estimating historical burn data across the CAA using a shorter window of time than the literature cited, and only applying MODIS burn areas rather than a combination of MODIS burn area and burn hotspots that would show larger areas of historical fires within the CAA.

	This deviation does not affect the applicability of the methodology, additionality, or the appropriateness of the baseline scenario.
Quantification Impact:	Ex-post emissions from peat burning are lower as a result of using this updated literature value.

Third Deviation	
Source:	Project Description Section 3.2 and Monitoring Plan Section 8.1, VM0004 Methodology Section 19.2.3
Criteria and Procedures:	The monitoring of land cover change is completed for the length of the monitoring period rather than annually.
Relation to Monitoring or Measurement:	This procedure is a key component of monitoring, especially with regards to carbon accounting and emissions estimates.
Timeline for Deviation	June 22, 2014 – crediting period end date
Requested Deviation:	As opposed to the annual monitoring of land cover change as required by the VM0004 Methodology, the project will monitor land cover change once, at the end of each monitoring period.
Justification:	The change from annual monitoring of land cover change to monitoring once at the end of the monitoring period has no effect on the accuracy or conservativeness of the LULC change assessment. In fact, the classification of LULC change once during a monitoring period reduces the likelihood of errors in classifications and reduces needless expense and complexity for the project proponent and allows for the best cloud-free product to be utilized for the monitoring period in order to improve classification results. Most VCS methodologies have no annual monitoring requirements as these prove to be prohibitive cost-wise for projects. Additionally, a time series of data (including Landsat and MODIS) over the monitoring period can be used to confirm areas of land cover change due to fire or other causes, which can serve to confirm LULC classification in the final image. This deviation does not affect the applicability of the methodology, additionality, or the appropriateness of the baseline scenario.
Quantification Impact:	LULC change monitoring once at the end of the monitoring period has no quantifiable impact on emissions estimates. However, it does serve to minimize classification error and maximize the availability of cloud free-data, providing a more accurate estimate of LULC change over the monitoring period.

Fourth Deviation	
Source:	Project Description Section 3.2.5 (Monitoring, including estimation, modeling, measurement or calculation approaches), VM0004 Methodology Section 19.2.1.2

Criteria and Procedures:	The project will establish a procedure to back calculate the number of logging gaps within a given area of observed logging activity in the event that neither aerial imagery nor field crews could obtain the necessary data.
Relation to Monitoring or Measurement:	This procedure is related to monitoring for forest degradation and the measurement of the number of logging gaps
Timeline for Deviation	June 22, 2014 – crediting period end date
Requested Deviation:	The number of logging gaps will be calculated by dividing the known area of observed logging activity by the average area of one logging gap. This procedure is to be applied when the number of logging gaps is unable to be estimated through field crews or review of aerial imagery.
Justification:	The number of logging gaps estimated by this method is highly conservative as it assumes the entire area in which logging activity was observed was impacted by logging.
Quantification Impact:	This method would increase the estimated emissions over the monitoring period due to logging activity.

2.2.4.2 Project Description Deviations from Previous Monitoring Periods

First Monitoring Period Deviations (July 2009 to June 2010)

The Project Management Zone of 91,215 hectares was described and spatially delineated in the validated Project Documentation. Since validation the Project Management Zone, managed by the Project Proponent has been slightly reduced to 81,414 hectares.

The carbon accounting area (CCA) has not changed. As such the deviation to the Project Management Zone has no impact on the net GHG reductions from the Project activities.

Second Monitoring Period Deviations (July 2010 to June 2013

No Project Description deviations during this monitoring period.

Third Monitoring Period Deviations (July 2013 to June 2014)

No Project Description deviations during this monitoring period.

2.2.5 Risks to the Project (G3.5)

The main identified risks to the project benefits are loss of carbon stocks due to ongoing pressure from oil palm expansion in the northern boundary and from fires lit by bordering communities to clear land and expand agriculture. These risks (whether natural or human-induced) would be expected to impact climate, community, and biodiversity benefits during the project lifetime. Fire has an impact on climate benefits through the release of carbon emissions from aboveground forest and belowground peat deposits, and can be expected to negatively impact biodiversity benefits through destruction of

habitat. Fire can also negatively impact local communities as the smoke can cause respiratory illnesses and reduce the amount of overall GHG emissions reductions from the project, thereby reducing the project's funding.

Through the utilization of carbon funding, the Rimba Raya Biodiversity Reserve Project has expanded and enhanced the patrol and protective work being undertaken in the area since 1971 by OFI. This funding has increased the patrols to act as a deterrent and the physical presence through marking of boundaries as well as the installation of posts and fire towers in order to efficiently monitor and respond to threats.

Forest patrols protect the forested area from illegal activities by way of community socialization. Communities around the project area are included in patrols, thus the communities are made aware that such illegal activities are forbidden. Patrol activities are conducted by monitoring vulnerable areas either on foot, by motorcycle or by cess (small boat for 2 – 4 persons).

In addition, funds are available for enterprise development to reduce the pressure on agriculture expansion and oil palm expansion with the ambition to maintain and enhance the climate, community and biodiversity benefit beyond the life of the project.

The project has continued to make the necessary investments in job creation and income generation activities for the local communities from the sale of credits in the voluntary market so that agricultural expansion is less sought after.

2.2.6 Enhancement of High Conservation Values (G3.6)

A preliminary analysis of HCVs in the project zone determined that 12 of the 13 HCV sub-values defined in the Toolkit for Indonesia were potentially present. Observed HCVs are included in the table below (Table 5). More details related to these HCVs and their maintenance in the project zone can be seen in their respective sections, 4.1.3 and 5.1.2.

High Conservation Value Present in Project Zone		**Relevance**
1.1	Areas that Contain or Provide Biodiversity Support Function to Protection or Conservation Areas	Biodiversity
1.2	Areas that Contain Critically Endangered Species	Biodiversity
1.3	Areas that Contain Habitat for Viable Populations of Endangered, Restricted Range or Protected Species	Biodiversity
1.4	Areas that Contain Habitat of Temporary Use by Species or Congregations of Species	Biodiversity
2.1	Large Natural Landscapes with Capacity to Maintain Natural Ecological Processes and Dynamics	Biodiversity
2.2	Areas that Contain Two or More Contiguous Ecosystems	Biodiversity
2.3	Areas that Contain Representative Populations of Most Naturally Occurring Species	Biodiversity

3	Rare or Endangered Ecosystems	Biodiversity
4.1	Areas or Ecosystems Important for the Provision of Water and Prevention of Floods for Downstream Communities	Community
4.3	Areas that Function as Natural Barriers to the Spread of Forest or Ground Fire	Community
5	Natural Areas Critical for Meeting the Basic Needs of Local People	Community
6	Areas Critical for Maintaining the Cultural Identity of Local Communities	Community

Table 5: High Conservation Values Present in the Rimba Raya Project Zone

Maintenance or enhancement of all these HCVs depended directly on the protection of remaining forest, retention of connectivity between remnant forests in the project zone with those of TPNP, potential rehabilitation of degraded riparian forest zones in the project area, and prevention of oil palm expansion to protect water quality and associated aquatic habitats of the Seruyan.

Specific measures taken to achieve these goals included the implementation of planned project activities. These project activities included the establishment of the Rimba Raya Reserve, creation of a guard post network, establishment of a fire plan and monitoring plan, forest enrichment and rehabilitation, creation of an indigenous species/cash crop/community based agroforestry program, development of a social buffer, construction of community centers, enhancement of agriculture and aquaculture productivity, introduction of fuel-efficient stoves, the planning of of a sustainable health care system and floating clinic, establishment of capacity building program as well as several other project activities.

Implementation of these project activities has directly and indirectly protected and/or enhanced the HCVs that are present in the project area. Moreover, many project activities positively affect multiple HCVs. For example, the creation of a guard post network protects nearly all of the present biodiversity and community HCVs in the project area. In terms of biodiversity, it has allowed for the surveying and patrol of large areas of forest; this allowed for protection of HCVs 1.1-1.3 as well as 2.1 and 2.2. Guard tower networks have kept watch for illegal activity or natural disturbances (fire) which may directly affect vulnerable/endangered species as well as representative populations of native species (1.2, 2.3, 3).

In terms of community, the forest guard post network has acted as a monitoring system for fire and floods, directly affecting community HCVs 4.1 and 4.3. Likewise, guard networks and forest patrols have protected areas of the forest from illegal activity and degradation thus protecting areas which are critical for the needs and identities of local people (HCVs 5 and 6). Like this project activity, there are other project activities which have protected and/or enhanced multiple HCVs that have been identified as present in the project area.

2.2.7 Benefit Permanence (G3.7)

In order to maintain and enhance the climate, community and biodiversity benefits beyond the project lifetime, the project proponent has developed a model that will protect the Rimba Raya Project area

in perpetuity. In the creation of this Reserve, the carbon stocks and biodiversity of the project area are intended to remain intact beyond the lifetime of the project because the Reserve itself will be protected from conversion to palm oil plantation indefinitely. In this protection, critical habitat is safeguarded for numerous species and carbon stocks present in forest and peatland swamps remain intact.

The creation of the Reserve, as well as the revenue made from the sale of carbon credits, has and will continue to fund community-based action so that benefits are experienced during the lifetime of the project and that they positively impact future generations of the community. The creation of the Reserve allows for continued community benefits such as sustainable livelihood opportunities, equal opportunity employment for women and other marginalized groups, as well as sustainable food sourcing production. This is because the Reserve itself provides sustainable employment opportunities and agroforestry-based food production, among other community benefits that will remain permanently intact.

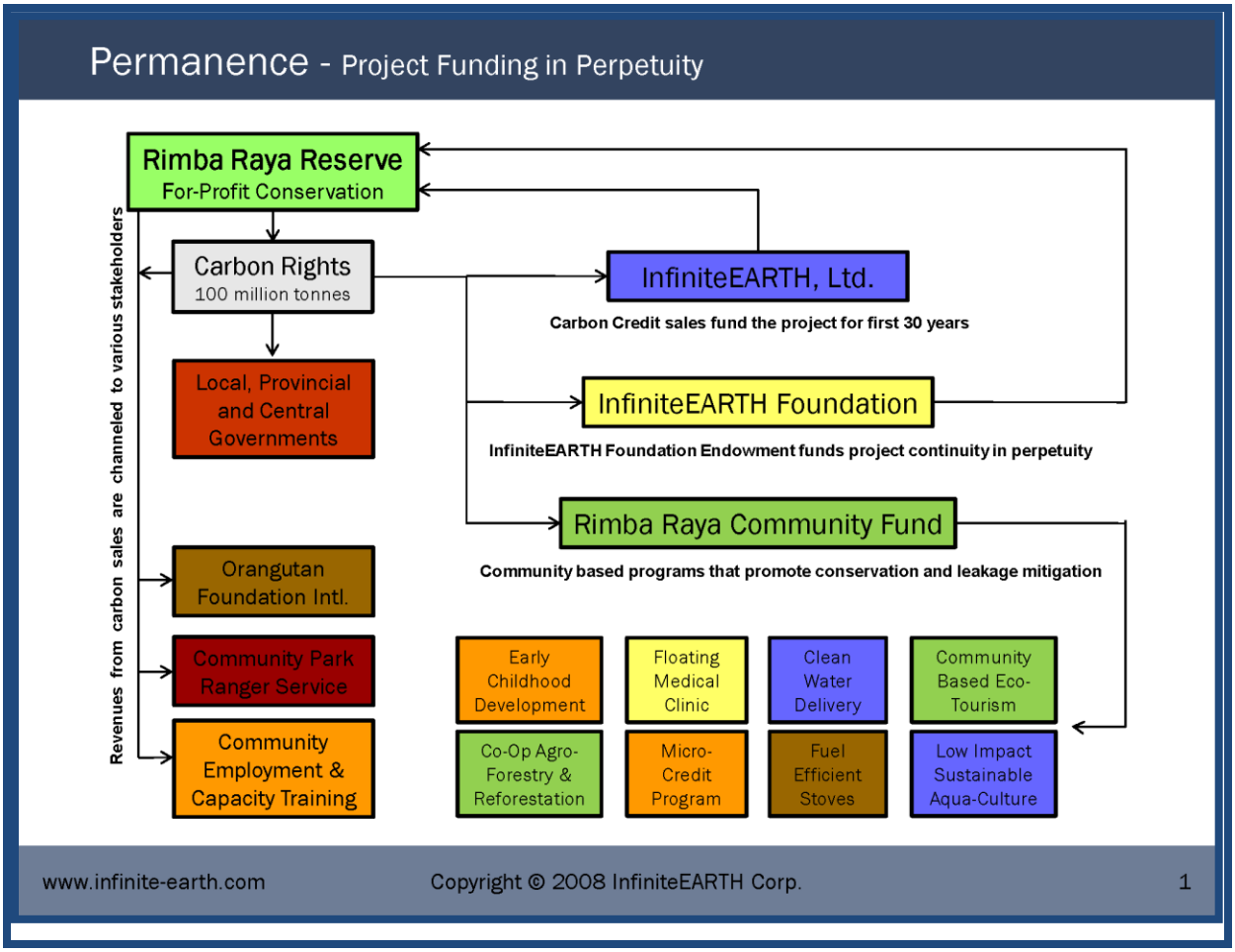

Figure 2: Outline of project permanence in terms of funding

2.3 Stakeholder Engagement

2.3.1 Community Consultation (G3.8)

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 and studies, 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.

The project proponent has worked to create effective means of communication and consultation with the community so that their input can help to steer the project. In partnership with World Education, a well-known development organization that has been working with communities in the area since 2003, the project proponent has engaged local communities to assess community development needs, local uses of surrounding forests and community land uses. Socio-economic studies were carried out throughout the course of project development and implementation. The most recent study, conducted in 2017, provided an updated look into the lives of stakeholders living in the project zone in terms of physical, financial, social and natural capital indicators (See Rimba Raya Endline _QUICK SURVEY _Edy September 2017.xls). The results from the study's consultation and survey components provided a deeper understanding of community needs and were incorporated into the development of the project so that program goals match local needs.

Findings from the most recent socio-economic study indicated that the majority of the population in the project zone is experiencing high levels of deprivation as dictated by fluctuating income streams and the cost of food being the largest expenditure. These economic conditions and food security depend almost entirely on local natural resources – fisheries, water, firewood and rice production – which can be inconsistently available or accessible at any given time. Because palm oil plantations act as a large provider of reliable employment for local stakeholders, they are viewed as predominately positive among community members. These trends are also observable among education and health sectors. Also notable in the recently completed study was the variability amongst the eight villages surveyed concerning the outlined indicators, despite their geographic closeness. This has reinforced the appropriateness of the project's approach in how it designs its development and implementation; intensive community-based interventions that are tailored to the local needs of the local communities are necessary for successful and effective projects.

Stakeholders were welcomed and encouraged to provide feedback to OFI and WE and well as to IE directly. One method of ensuring this communication occurred was through the creation of village agreements. Village agreements between the Rimba Raya Reserve and a community (as a partner of Rimba Raya) contained mutually agreement upon points in order to ensure benefit sharing was implemented for village communities. Figure 3 below shows the process for appropriately carrying out village agreements. Additionally, the Early Warning Early Response system has been implemented (additional information can be found in Section 2.3.4) and encourages community members to report any concerns, possible issues, suggestions, or advice to a unit manager or member of the community development staff. Each village has at least one such person who has

been trained to respond to these by bringing the concern to Rimba Raya in order that a proper response can be made.

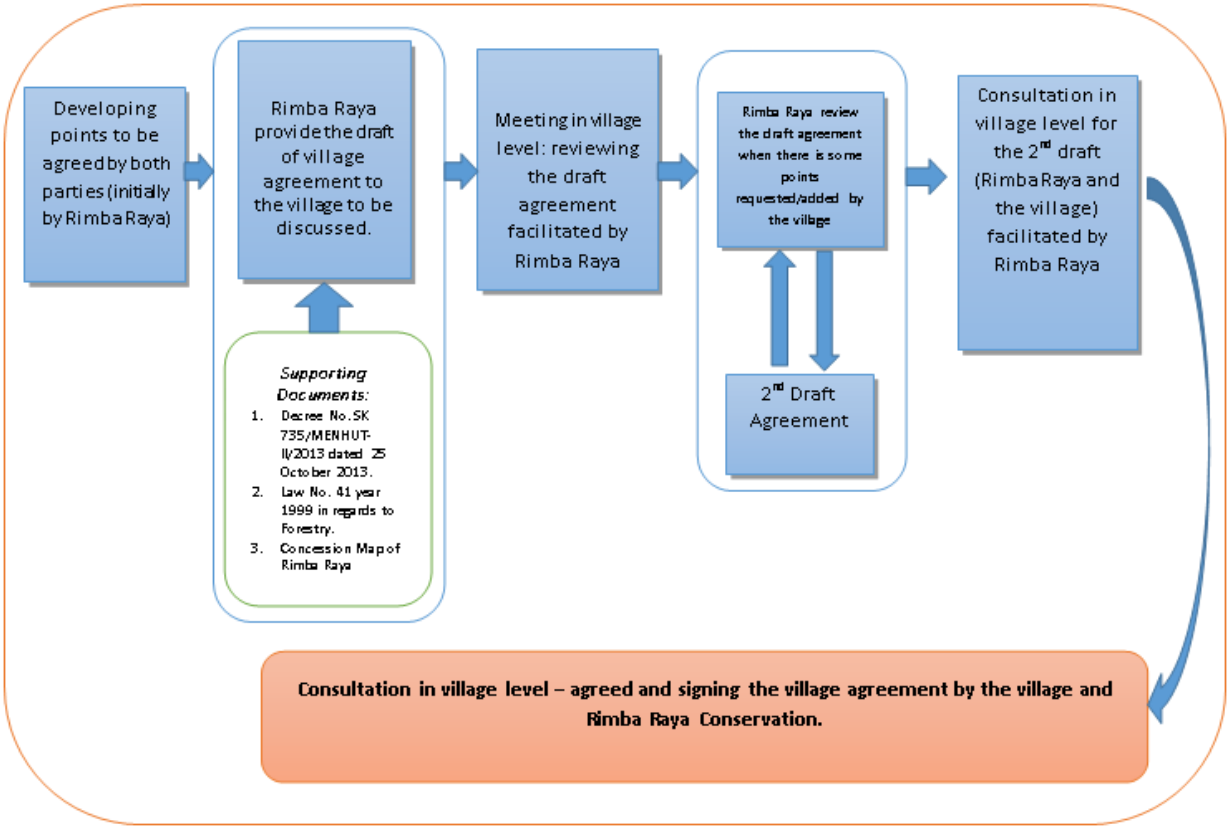

Figure 3: Agreement Process between Rimba Raya and Project Participants at the Project Level

During this monitoring period, this process was carried out with several communities. The table below (Table 6) shows the communities that signed agreements during this monitoring period.

No	Name	Sub-District	Status	Date
A	**NORTH UNIT**			
1	**Ulak Batu**	Danau Sembuluh	Signed	22/04/2015
2	**Palingkau**	Danau Sembuluh	In discussion (final drat)	
3	**Cempaka Baru**	Danau Sembuluh	In discussion (first draft)	
4	**Telaga Pulang**	Danau Sembuluh	Signed	15/01/2015
B	**CENTRAL UNIT**			
5	**Baung**	Seruyan Hilir	Signed	16/01/2015
6	**Muara Dua**	Seruyan Hilir	Signed	12/01/2015
7	**Jahitan**	Seruyan Hilir	Signed	19/06/2016
8	**Tanjung Rangas**	Seruyan Hilir	Signed	22/01/2015

C	SOUTH UNIT			
9	**Sungai Perlu**	Seruyan Hilir	signed	16/01/2015
10	**Pematang Limau**	Seruyan Hilir	In discussion (final drat)	15/09/2016
11	**Kuala Pembuang 1**	Seruyan Hilir	signed	
12	**Kuala pembuang 2**	Seruyan Hilir	On progress	
13	**Sungai Undang**	Seruyan Hilir	On progress	
14	**Persil Raya**	Seruyan Hilir	On progress	

Table 6: Signed Community Agreements within this Monitoring Period

Participatory mapping among communities was also a tool used to engage stakeholders in the project consultation process. The participatory mapping activities consisted of sketching project activities of community areas based on traditional utilization patterns. This activity was directly managed by Rimba Raya, which engaged with WEI as a community development consultant beginning in 2015. Rimba has focused on involvement between community members, community government and local leaders.

During this monitoring period, participatory mapping was carried out in several villages and included numerous participants. More details are included in the table below (Table 7). Additional proof of participatory mapping in the above communities may be provided upon request.

No	Village	Duration	Participants Number
1	Muara Dua	14 – 16 Des 2015	105
2	Baung	11 – 13 Feb 1016	119
3	Tanjung Rangas	2 – 4 Maret 2016	145
4	Jahitan	14 – 15 Maret 2016	102
5	Pematang Limau	23 – 25 Maret 2016	139
6	Telaga Pulang	6 – 8 April 2016	103
7	Ulak Batu	15 – 16 Sep 2016	70

Table 7: Location, Date, and Participation of Villagers during this Monitoring Period

The goals of participatory mapping included the following:

1) To sketch information on community management areas (traditional utilization) and spatial planning of villages around Rimba Raya Conservation.

2) Obtain information on the development areas of district level program in relation with the utilization of the area around Rimba Raya Conservation.

3) Act as the basic ingredients in the development planning of Rimba Raya Conservation along with village and district development.

4) Act as a learning media for the community and village government in the process of n village planning development.

5) Act as a learning media for community development staff in utilizing the participatory planning methods.

In working to accomplish these objectives, community members were able to voice their opinions and experiences, consequently influencing the direction of the project. Project proponents recognize the value of community input and strive to have community input influence the project. Through adaptive management, feedback from community members was used to change certain aspects of the project. For example, initial recipients of cookstoves complained that the cookstoves being distributed were inefficient due to their limited size. They suggested that gas stoves be purchased in the future, although recipients of the initial cookstoves kept them and continue to use them. However, moving forward, gas stoves are being preferentially being purchased for project members. Through community participatory mapping, decentralization of the grievance process to local community development staff, and subsequent adaptive management practices, community members are given the chance to be directly involved with project planning and implementation.

The Scheme of Participatory Mapping on Land and Pattern Utilization - Conservation

Phase I
Pre-Condition

Developing village team (Ground Check & Arranging Village Development Planning – medium term)

Recognizing the village administration area including Forest cultivated area and Non forestry cultivated area.

Documentation recording

Village boundary solution – between adjacent villages.

Analyzing the stakeholder's relations development.

Documenting the village potentials (updating village monography book).

Phase II
Implementation
Workshop village level

General Definision

Village area analysis:
- *Sketching the land utilization (EcoSocCul) and resource utilization pattern = Theme Map/Sketch;*
- *Seasonal Calendar;*
- *Institutional Structure.*

Forum Group Discussion – Analysis village sketch, seasonal calender, and institution:
- *Problem & Potency*
- *Cause – Solution – Sufficient Action layak*
- *Problem rate/level*

Sketch of land utilization and participatory village potency with conservation basis.

- *Vision and Mission of village development*
- *Strategy issue and problem*
- Policy direction and village development priority

Phase III
Implementation
On the Site Mapping

General Definition

Training: to use mapping tools (compas, Klino, GPS, sheet data) and to learn the mapping technique (data collection/Ground Check)

ground check and boundary determination

Input data - GIS

Developing the draft of village potency

Figure 4: The Participatory Mapping Process for Community Involvement

Other, more general, methods of communication to inform stakeholders included postings on the "village board," announcements at the mosque as well as other publicized written media. Stakeholders were able to provide feedback through telephone calls, email/instant messaging, letters and of course, in-person visits with project proponents and other project partners.

A summary of this report has been prepared and copied for distribution in all of the villages within the Rimba Raya operational area as well as district and sub-district seats. Notices have been placed in all villages about the availability of these summaries in each of the villages and announcements included within local newspapers where Rimba Raya has a presence. World Education and Rimba Raya office locations have copies of this summary to distribute to community members that make a request, and efforts were made by all staff when working with the community members on other components of the programs to share that these were available.

The socioeconomic study as well as other social surveys, participatory mapping exercises, collective village agreements, and other forms of dialogue with community stakeholders allowed for the inclusion of their feedback into project decision making. Through adaptive management, stakeholder feedback has been used during project development and implementation during this monitoring period in order to influence the project, such as the transition to gas stoves based on community feedback.

2.3.2 Public Comment Period Publicity (G3.9)

In order to ensure that the communities were aware of the public comment period, the community information board was updated to notify communities of the public comment period and audit site visit, as well as to provide copies of monitoring results and report summaries in the local language.

At the beginning of the project, a community awareness program was carried out which disseminated information about climate change, carbon trade and the operational plan, including information about providing public comments and expressing grievances. Informational packages were also distributed containing this material. Likewise, posters, brochures and SOPs were dispersed among the local communities. Any key documents, such as monitoring reports, were made available to all communities.

Together with World Education, the project proponent conducted leadership training for the village heads (or village representative) on facilitating the management of community comment-grievance, as well as on the subject of climate change versus local livelihood. Comprehensive focus groups followed in each village to further explain the public comment period to all households.

The project proponent installed 30 "post-office" boxes in 14 villages so that comments could be submitted. During this monitoring period, the boxes remained and still served as a channel for community members to submit comments and grievances.

2.3.3 Distribution of Project Information (G3.9)

A summary of this report and the monitoring results has been prepared and copied for distribution on the community information board in all of the villages within the Rimba Raya operational area as well as district and sub-district seats. Notices have been placed on the community information boards within all villages about the availability of any summary or important project documentation and announcements were included within local newspapers where Rimba Raya has a presence. World Education and Rimba Raya office locations have copies of this summary and all other key documentation to distribute to community members that make requests, and efforts were made by all staff when working with the community members on other components of the programs in order to share the information that these were available. All information was made available in the local language.

2.3.4 Conflicts and Grievances (G3.10)

A formal grievance/conflict resolution process had been previously instituted and publicized (see SOP - Handling Conflicts and Grievances .docx). During this monitoring period, the process has continued to be publicized and practiced as originally intended. It has all elements needed in the process to make sure it meets with standard conflict resolution protocols. However, some changes have been implemented that have handed additional responsibilities to local community members. For Example:

- Managed by a Third party – WEI has handed over the responsibility for receiving and mediating between the communities and Rimba Raya to local villagers that have been trained as community development staff. WEI trained these villagers with funding from Rimba Raya on how to be productive facilitators within the village and how they should be addressed. The 1st training was completed 9 to 11 June, 2015 in Telaga Pulang and the second was completed 28 January to 1 February, 2016 in Kual Pembuang. Additional information on this training can be found in Capacity Building for comdev Staff 2016.docx.

- Formal Process – World Education has informed all villages on the process of contacting them to submit a grievance or resolve a conflict. Posters have been posted publically. This process was completed in 2010, but the procedure has continued to be publicized by community development staff at a more local level.

- Publicized - All communities and stakeholders were informed of the 3rd party mediation of WE by 2010. Posters have been installed in all communities. Stakeholders were informed in face to face meetings by Rimba Raya personnel. Since 2013, work has been completed to inform villagers on the transfer of responsibility to local community development staff.

During community consultations, the project proponent explained the conflict resolution process and provided clear verbal and written guidance on how grievances can be raised to the proponent. More

information can be found in SOP - Handling Conflicts and Grievances .docx. These issues are handled in the following manner:

1. Each community has been provided with a method and contact details for a third-party intermediary who represents the project proponent. Often times this was World Education.

2. When a grievance had been lodged, the third-party intermediary notified the project proponent and contacted stakeholders who lodged the grievance within one week after submission to discuss their concerns.

3. The stakeholder lodging the grievance met independently with a designated Indonesian representative of the third-party intermediary organization to identify concerns and discuss potential solutions. The intermediary documented the nature of the grievance, the actions being requested and the list of potential solutions that were discussed at the meeting with the stakeholder.

4. Where a significant grievance was lodged, the third-party intermediary then reported to the project proponent about the grievance being lodged.

5. The third-party intermediary and the project proponent met to decide on the appropriate course of action to address the issue.

6. The third-party intermediary then reported back to the stakeholder to present the solution.

7. This exchange of information continued until the dispute has been resolved.

8. The time frame should be no longer than 30 days.

9. Project proponents then prepared a report on the resolution process, which was made accessible to stakeholders.

In addition to this process, the Early Warning Early Responses (EWER) procedural community conflict resolution process was implemented by Rimba Raya during this monitoring period and works in the following way:

1. If field staff finds a potential problem, they are to notify the Unit Manager.

2. If field staff receives a complaint from a community member, they are to notify the Unit Manager.

3. The Unit Manager analyzes whether they can resolve it in the field themselves.

4. If the Unit Manager can handle the issue, they have the authority to resolve it, but still must report it to the General Manager.

5. If they can't handle the issue, the General Manager will respond to the issue.

6. If the General Manager needs additional support to resolve the issue, higher management is notified.

7. A legislative hearing will be completed if needed.

With the decentralization of responsibility from WEI staff to trained community members, villagers should be more likely to come forward with any complaints or grievances. Additionally, trained community development at a more local level will have a better understanding of these issues and be able to properly address them.

2.4 Management Capacity and Best Practices

2.4.1 Required Technical Skills and Expertise (G4.2)

The technical skills and expertise of the project proponent and project partners were maintained during this monitoring period so that project activities were implemented successfully.

Key technical skills were provided by ecoPartners LLC with regards to the monitoring and quantification of project GHG emissions reductions. ecoPartners LLC is a forestry-based company that works with project developers, forest owners and verification bodies to build successful carbon offset projects. ecoPartners possesses expertise in the technical aspects of project design, planning and development including biometrics, accounting methodologies and remote sensing. ecoPartners has extensive experience validating and verifying projects under multiple carbon standards, including both VCS and CCB. During this monitoring period, ecoPartners has provided technical input with remote sensing, land use change analysis and project documentation as well as guidance support through verification. EAS has been involved with this project during previous monitoring periods and previous verification events and thus served as a third party source of information to ecoPartners in terms of land use and accounting analyses. Specifically, EAS contributed to fire measurements and peat burn depth analyses in previous years that were integral in ecoPartners' current analyses.

Key technical skills that were carried out which pertain to project management include supervision of the physical assets of the Reserve, administration maintenance of logistics, budgets and human resources and finally, management of REDD policy and the certification of carbon credits. The project proponent, InfiniteEARTH and the project partner, OFI possess a wealth of experience in these categories. For example, Todd Lemons, the CEO of InfiniteEARTH Todd Lemons has 25 years of experience managing offshore natural resources projects with field operations experience in Chile, Bolivia, Brazil, Malaysia, and China. OFI, a principal partner organization, has 37 years of experience co-managing Tanjung Puting National Park, including the construction and permanent staffing of 19 guard posts throughout the park and inside the Project area. This expertise was necessary for the success of the most recent monitoring period as activity continued in Reserve management, administrative tasks and organization of a REDD carbon project.

Key technical community engagement skills implemented in the most recent monitoring period include communication, community organizing, conflict resolution, community mapping, community development and monitoring. Project partners, OFI and World Education possess and maintain the above skills so that project implementation was successfully carried out during this monitoring period.

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.

Although Orangutan Foundation International (OFI) is an organization dedicated to the conservation of wild orangutans and their rainforest habitat, OFI also supports education initiatives, creating awareness concerning orangutans and has had years of experience working with the staff at the nearby TNTP.

These organizations engage the communities surrounding the park in informational meetings, educational workshops, capacity building and skills development, as well as conservation work. In the process, they have disseminated information about the importance of protecting the park and generated goodwill in communities inside the Project zone, laying a sturdy foundation for continued stakeholder engagement during project implementation. Both of these organizations have been and continue to be intimately involved in project implementation.

Key technical skills to assess and monitor biodiversity within the project zone include forest cover and condition mapping, ecosystem mapping, botanical surveying, orangutan surveying, mammal surveying, bird surveys and camera trapping.

OFI has a deep store of technical expertise and experience in monitoring, assessing, and rehabilitating orangutans and other species of animals and plants important to the survival of orangutans. Project proponents have drawn upon this set of skills and expertise in implementing biodiversity-related project activities.

Until 2015, PT Pandu Maha Wana Asia Pacific Consulting Solutions was in charge of field staff management and operations, measuring and monitoring, community development and ecological restoration. When the contract with PT Pandu Maha Wana ended in 2015, the Rimba Raya staff assumed all direct responsibility for these operations.

The project proponent and its partners are qualified in their expertise and contribute the technical skills required to complete the above actions. In doing so, project implementation has been successfully maintained during this monitoring period.

2.4.2 Worker Training (G4.3)

Capacity building and worker training are critical elements in the operation of the Rimba Raya project's social service program. In order for these initiatives to succeed, members of the community

need the skills necessary to effectively implement project activities. It has therefore been imperative for the social service provisions to not just create additional employment, but also provide training in the skills required to maximize these opportunities. Training and capacity building efforts have been designed in collaboration with the communities to ensure that they address current community concerns and prioritize community needs.

Progress in worker training and capacity building that have been made during this monitoring period include:

Forest patrol and security

- Rapid Assessment (RA) training has been carried out twice: Basic Training in early March of 2016 and Refreshment training in early March of 2017. The trainings were conducted in 3 units: North Unit, Central Unit, and South Unit. The trainings were attended by all Rimba Raya field staff and are mandatory. The purpose of this training was that all field staff should have basic knowledge of the activities, basic objectives, processes, and outcomes of this RA activity. So it is expected that field staff not only perform this activity based on obligations, but also understand the importance of data obtained.

Firefighting and prevention

- 12 – 14 Oct 2015: Training of Firefighting and how to use waterax fire equipment, in Muara Dua village – Central unit.
  Trainer: Brad Sanders
  Participants: 33 people (RRC staff, TNTP staff, and community members)

- 13 – 17 January 2016: Training of Firefighting and how to use and maintain fire equipment, in Telaga Pulang village – North Unit.
  Trainer : Brad Sanders
  Participants: 38 people (RRC staff, TNTP staff, and community members)

- 21 – 22 Mar 2017: Training to make hydrant well (made water source) for firefighting in the forest - Natai Kopi - Ulak Batu village
  Trainer : Febrasius & Herry Soeyatno
  Participants: 16 people (RRC staff, TNTP staff, and community members)

- 14- 24 September 2016: Socialization and introduction of fire preventing and firefighting protocol was conducted in all units.
  Socialization and introduction performed by Fire Technical staff
  Material: FDR calculation, information system, and fire communication, patrol and monitoring and initial action.

- 6-11 Maret 2017: Refreshment of Socialization and introduction of fire preventing and firefighting protocol for all Climate and GIS technical staff, Biodiversity technical staff, TNTP and all other field staff.
- 12 – 14 Okt 2015: Firefighting Training using Waterax located in Muara Dua village – Brad Sanders as trainer
- 13-17 Jan 2016 : Fire Management Training located Telaga Pulang – Brad Sanders as trainer
- 21 July 2016: Preparing forest and land fire prevention in collaboration area.
- 21 – 22 Mar 2017: Training – make drilled/hydrant well for firefighting water source in Natai Kopi - Ulak Batu village.

Wildlife monitoring

- 2015 - Logistic support for conducting patrol - per 3 months IDR 5.835.000)
- 21 Sep 2015 - Coordinating hotspots in northern area of Rimba Raya Conservation
- 22 – 24 Jan 2016: Survey work post location in Segintung River - Muara Dua village

Agro-forestry, ecosystem restoration, and HCV training

- 30 Sep 2014 – 16 Oct 2014: Forestry training on forest planning for local field staff conducted by the provincial Ministry of Forest Management. Certificates were handed out to staff that completed this training (See Sertifikat GanisPHPL Binhut Hairudin.jpg and Sertifikat GanisPHPL Canhut Karno.jpg)
- 14 – 18 Dec 2015: HCV training for biodiversity technical staff
- Feb 2016 - Meeting for ecosystem restoration in Taman Nasional Tanjung Putting
- Rimba Raya assisted the local government at the district, sub-district, and village level on GPS training

Small business development

- 22 May 2016: Handicraft training by WEI with support from Rimba Raya with the women's group Ratik Bahalap in Telaga Pulang
- Development for a training program has begun, specifically targeted to increase skills for women's capacity building in relation to two new entrepreneurial activities
- Microcredit has been explored as an option to help support field training

Throughout the course of the project, Rimba Raya has targeted a wide range of people in the communities with capacity building efforts in regard to the various needs of the project. Members of the communities from all groups, including and especially women, are encouraged to apply for available positions.

Since most or all of the communities have members under the employment of Rimba Raya, skills and capacities have become part of the fabric of the communities regardless of turnover. As all new employees need to be trained, the skills gained in each community have not been lost. Likewise, as demonstrated above, refresher courses have been provided routinely to reorient workers and/or update them on new methods.

Figure 5: Members of the Community Participating in Applied Training

2.4.3 Community Employment Opportunities (G4.4)

Job announcements for the local villages were distributed one month before the hiring of our permanent field crews began and a series of interviews were conducted in the villages where these crews were to be located. The project proponent advertised applicable employment opportunities by contacting village heads and by posting to announcement boards in village offices and mosques. Partner organizations OFI and WE also disseminated employment information.

The Rimba Raya Recruitment Policy ensured that members of project zone communities were given priority for all project-related positions. Priority was given to community members for positions which met with their skills. As training for most staff was budgeted, prior technical experience was not imperative for some positions. In many cases, specialized local knowledge and relationships were more important than technical knowledge. For each position, once a proper applicant base was acquired – including adequate representation from women and other minority groups – an interview process featuring verbal and written consultations with multiple IE staff commenced with the goal of selecting the best candidate for the position.

The project has used community members several times as field guides and has made and effort to train community members in the skills of measuring peat and using such technical tools. During this monitoring period, 52 new personnel were hired for field monitoring positions. Additional positions which have been previously filled by community members include firefighting personnel and fire brigade, watercraft pilots, forest monitoring agents, reserve guards, orangutan care providers, conservation managers, field operations managers, administrative personnel and other monitoring staff. Further, community development staff from each village have been hired in the past to assist in implementing community development programs within their villages. Also, 1-2 people from each village were hired to focus on fire management since they have greater awareness of fire dangers in their area.

The Rimba Raya Recruitment Policy does not discriminate based on gender and ensures that an adequate number of women and members of other underrepresented groups have the opportunity to apply. During this monitoring period, the project continued to increase gender participation during the employment process since many of the women in the villages have greater long-term interest in how their communities develop and how opportunities for their family arise. Out of 73 direct employees of Rimba Raya in the project area, 18 are women.

In the course of this monitoring period, 11 women were hired for project-related jobs, 8 as Rimba Raya field staff and 3 as Sampit staff. In addition, significant progress was made during this monitoring period in terms of the project's micro-credit program. The micro-credit program provides additional budget, training and support for economic and entrepreneurial pursuits. This is especially important for women and other marginalized groups who did not apply or did not get hired for project-related jobs. Using the micro-credit program during this monitoring period, women's working groups were established and finances were secured for shrimp paste and chicken egg/meat production. Likewise, a handicraft working group was created, consisting of women who create souvenirs from recycled garbage.

2.4.4 Relevant Laws and Regulations Related to Worker's Rights (G4.5)

The main body of Indonesian law governing the relations between workers and employers is UU No. 13/2003.

In addition, the following conventions of the International Labour Organisation have been ratified by Indonesia:

- C81 – Labour Inspection Convention, 1947
- C87 – Freedom of Association and Protection of the Right to Organise Convention, 1948
- C98 – Right to Organise and Collective Bargaining Convention, 1949
- C100 – Equal Remuneration Convention, 1951

- C102 – Social Security (Minimum Standards) Convention, 1952
- C105 – Abolition of Forced Labour Convention, 1957
- C111 – Discrimination (Employment and Occupation) Convention, 1958
- C138 – Minimum Age Convention, 1973
- C169 – Indigenous and Tribal Peoples Convention, 1989
- C182 – Worst Forms of Child Labour Convention, 1999

Project proponents have maintained their strong commitment to inform all stakeholders of their rights with respect to the project. The Rimba Raya project has exceeded all local labor requirements and ensured that all workers were apprised of their rights.

Rimba Raya has company regulations that are required by law for any Indonesia company, foreign or national that has more than 10 employees. These company regulations are de facto regulated "labour agreements" that have been developed through negotiation between management and employees and have been ultimately approved by the the Department of Manpower, which is the national regulatory department in charge of worker safety. They check to ensure they met all legal requirements.

During this monitoring period, the national government has passed two new laws relevant to worker's rights for the project.

1. Government Regulation No. 45 on 30 June, 2015, on the Arrangements for Guaranteed Pensions Program

This law requires employers to register their employees with the Social Security Employment Agency and to participate in the Pension Guarantee Program. This requires the employer and employee to invest 2% and 1% of the employee's montly wages, respectively, into the pension fund.

2. Government Regulation No. 46 on 30 June, 2015, on the Implementation of Old-Age Savings Program

This law requires employers to register their employees into a retirement fund for each employee. This requires the employer and employee to invest 3.7% and 2% of the employee's monthly wages into the retirement fund.

Both these laws have been followed for all employees in the Rimba Raya project starting on 7 September 2015.

Every employee has signed an employment agreement and has been provided a copy of the company regulations so they are aware of their rights, the policies of the company and can ask

questions on any part they may have concerns with. Additionally, periodic reports have been provided to the Department of Manpower relating to employee relations, numbers of employees and locations in which any issues relating to labour laws can be identified and corrected. Salaries have been currently set at and will always exceed government mandated minimum wage for the areas that are being worked in.

2.4.5 Occupational Safety Assessment (G4.6)

Inherent risks arise for workers during project implementation and this monitoring period was no exception. While a majority of project activities do not entail extraordinary risk, there are some which include a degree of risk that is inherent to their nature.

The majority of worker related risks stem from the project activities of reserve patrol, fire response/brigade, and orangutan care. These risks may include violent confrontation with illegal loggers/poachers/palm oil personnel, a multitude of serious and non-serious injuries from patrolling/traveling within the reserve itself, fire burns, smoke inhalation, orangutan bites/marks/scratches and infection which may follow most of the above listed possibilities. Design and implementation of these project activities includes measures to minimize risks to worker safety.

During this monitoring period, risks were best minimized by informing workers about risk, properly training workers with best practices in order to minimize risks, and providing adequate equipment/tools. Verbally informing workers of these risks and how to minimize them is included as part of worker training, orientation conversations and training refreshment courses. To date, these conservations have been of an informal nature with basic discussions of safety when new employees were hired, during occasional refreshment courses, and prior to field activities that require specific focus on safety issues.

Additionally, SOPs have been composed for occupational safety and health, proper use of personal protective equipment (PPE), as well as emergency situation responses (see Worker Health and Safety SOP v1.1). This SOP has been made available to project employees in the local language. PPE have been provided for current staff and will continue to be provided and emphasized from the standpoint of safety in the field. First aid and medical kits have been purchased to carry into the field when conducting field operations and larger ones have been purchased for each of the permanent field offices.

In the course of this monitoring period, retraining/refresher safety courses were carried out 5 times in relation to firefighting/fire brigade and twice in relation to field monitoring operations. As a result, no major injuries to project employees occurred during this monitoring period. By providing safety training, informing workers of potential risks, and supplying workers with protection equipment and first aid, project risks related to occupational safety were minimized during this monitoring period.

2.4.6 Financial Health of Implementing Organization(s) (G4.7)

InfiniteEARTH Ltd, the project proponent, has had revenues since 2013 when a large purchase was delivered to Allianz. Since that time, and in addition to that purchase, additional sales of several million credits have further secured and strengthened the financial positon of the project. Both Rimba Raya Reserve and InfiniteEARTH have funds available for project operations and manage their respective budgets in a fiscally conservative manner in order to enable the project to continue implementing its various initiatives without financial pressures. VCU sales information is publically available on the VCS website. Further proprietary documentation can be made available to the verification body.

2.5 Legal Status and Property Rights

2.5.1 National and Local Laws (G5.1)

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.

As demonstrated with previous successful verifications, the project has been and continues to be in compliance with all national and local laws and regulations of Indonesia that are relevant to the project activities, including the two new laws discussed above. During this monitoring period, the project has continued in carrying out this same compliance.

2.5.2 Free, Prior and Informed Consent (G5.3)

The project has not encroached uninvited on private, community or government property. The project has not required people to relocate and has maintained the local communities' right to access the area for fishing, small scale removal of trees and collection of forest products. The project has pledged to never re-locate any people that could conceivably encroach on the project area lands, although this has been actively prevented from occurring through patrols and education.

Because no parties' lands have been affected by the project, restitution or compensation has not needed to be allocated. There have been no changes in project design and implementation during this monitoring period which merit the need for the free, prior and informed consent of those whose property rights would be affected.

One area of concern relating to the above arose in the previous monitoring period through the discovery of people from Kuala Pembuang that bought land (not legally) along the government road running through the southern part of the concession from the town to the port and established either temporary or permanent structures within the boundaries of the concession. Options for dealing with this issue were discussed with the local government and involved several possibilities including but not limited to; reimbursement by Rimba Raya for money paid for the land subject to a valid receipt, relocation to another area by local government with an equal area of land, allowing "occupied" residents to remain and employing them as security and monitoring, and relocation of the road so that it is outside of the concession boundaries, thus less attractive from a development perspective. This issue was resolved through the signing of a new a boundary document by the MoEF, District, Sub-District, and Provincial governments. Additionally, a procedure was developed in which local communities may make individual claims to the District Land Agency by submitting all evidence they have demonstrating their ownership, and this agency is in charge of resolving the matter. However, no claims with regards to land ownership have been made at this time.

Based on consultations with community representatives, project proponents were able to determine that, with few exceptions, village and communal property lies to the east of the Seruyan River, inside the project zone but outside the project area. To the extent that community or individual villager property lies within the project area, project proponents have offered the option of integrating the property into the project's Community Agro-Forestry program or excising the land from the project area.

All project area land belongs to the Government of Indonesia, and the appropriate licenses and authorizations for management rights were put in place prior to commencement of major project activities and have been maintained during this monitoring period.

2.5.3 Property Rights Protection (G5.4)

Rimba Raya maintains the right of use for the project area. Rimba Raya's right of use to the project area is demonstrated in the 'working area map' presented below. The project has not required people

to relocate and has preserved the local communities' right to access the project area for fishing, small scale removal of trees and collection of non-timber forest products. The project has pledged to never re-locate any people that could conceivably encroach on the project area lands.

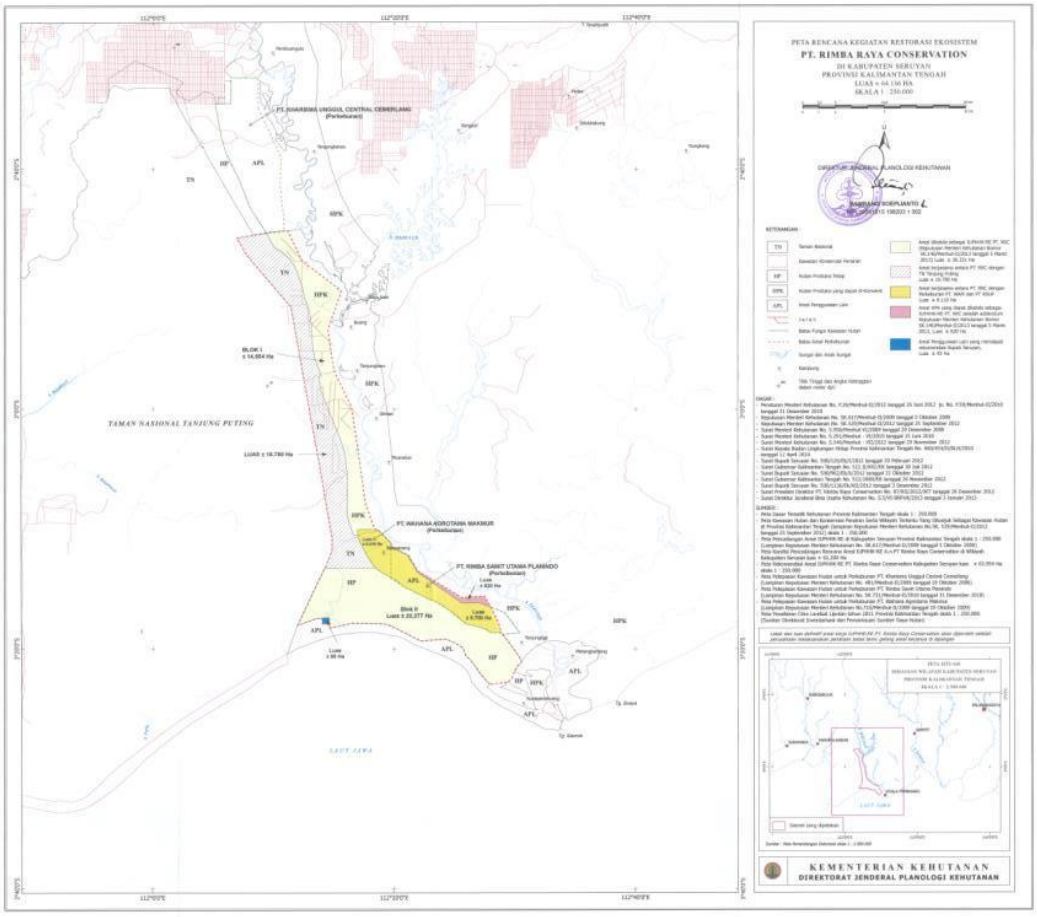

Figure 6: Original Agreements with PT Best for Conversion to Palm Oil

The agreement types with the relevant stakeholders are presented in Table 6 above.

Customary Rights

During interviews, community members reported no traditional or customary land claims in the project zone. Unlike Dayak elsewhere in Kalimantan, the villages did not have to adapt (indigenous) rules governing the management of land. Instead, land rights are privately managed, even though ownership rights continue to be retained by the national government. Though community members do not have formal documentary evidence of management rights, they have been passed down through generations and are locally acknowledged, with different parties aware of common boundaries between adjacent properties. Community members therefore reported that they have never had local conflicts over the land tenure amongst themselves.

In the area there is another category of land status called Hutan Desa or Lahan Desa, which appears legally to belong to the Desa, or administrative township. If this is forested it is called Hutan Desa. If it is deforested it is called Lahan Desa. This land can be claimed and used by individuals for agricultural purposes, but first they need to coordinate with the desa administration to do so. This entails requesting a Surat Keterangan Tanah (SKT), which, once received means the land rights become privately held.

2.5.4 Identification of Illegal Activity (G5.5)

The illegal activities that may be conducted from time to time in the project area and could affect the project's impacts include logging, deforestation and drainage by oil palm companies. In order to reduce these instances, the project proponent has implemented preventive measures and project activities aimed at identifying and mitigating the effects of illegal activities. The following subsections describe the activities and mitigation measures further.

Encroachment by Palm Oil Plantations

The principal illegal threat to the project's benefits has continued to be encroachment by the oil palm plantation inside the project zone, specifically to the north of the project area. The plantation has already expanded its operations beyond authorized boundaries, destroying valuable forest habitat. Moreover, the plantation's drainage canals threaten nearby peat deposits inside the project area.

Due to additionality requirements of REDD projects, the relationship between project developers and palm oil concessionaires was necessarily adversarial at project commencement. Upon project implementation, however, the relationship has become collaborative to avoid leakage. Project proponents have engaged the palm oil company with a series of steps designed to defuse threats. First, a guard post was built on the northern boundary, which serves as both a way to inhibit fire prevention and encroachment. Additionally, a pineapple plantation was built in this area between the project area and plantation, which serves as a fire break protection the forest. In exchange, project proponents have worked with plantation owners to identify and acquire viable non-peat land that has already been deforested for additional plantations.

Illegal Logging

There is a history of illegal logging inside the project area, and some indication that logging in the southern part of project area and extending into Tanjung Puting National Park has been ongoing. Social surveys of project zone communities indicate that this threat has not arisen from within the project zone, but rather from outside communities that have no legal or traditional stake in project area forests.

To mitigate this threat, project proponents have established a comprehensive network of guard towers and patrols to ensure the territorial integrity of the project area and prevent access by loggers.

Progress made during this monitoring period concerning this project activity is described in greater detail in section 2.1.1 of this report.

Resource Use Surrounding Communities

Although minor in comparison to the threat posed by both legal and illegal palm oil plantations, the surrounding communities have placed some pressure on the physical integrity of the Rimba Raya Reserve. Anecdotal evidence suggests that community members have engaged in limited hunting and fishing inside the project area and have occasionally logged trees for timber.

Since 2003, World Education has been working with farmers around TPNP to achieve food security and alleviate pressure on proximate forest land. In 2005, these efforts expanded into the Seruyan, beginning with the introduction of rice block management techniques to greatly reduce the impact of crop pests in four villages on the east side of TNTP. Five Seruyan villages (Tanjung Hanao, Ulak Batu, Palingkao, Buang, Muara Dua) have been participating in a program intended to yield rice self-sufficiency and diversify crops by introducing agroforestry. Where viable, WE has sought to introduce community gardens and aquaculture. One such project is the development of a pineapple plantation near the norther border of the project. This project provides co-benefits in the form of additional food security and a cash crop for community members, as well as acting as a buffer against encroachment from palm oil plantations near the area.

Under the auspices of the Rimba Raya project, this program will be expanded and extended to every village in the Project zone. Beyond that, project proponents have designed a slate of socio-economic programs designed to address poverty issues at the root of this threat. These programs, described in the Community Section, will create a social buffer and reduce this threat to project benefits.

With the exception of the oil palm encroachment, project partner, OFI has had a long and successful track record of monitoring the project area and deterring would be loggers and threats of fire such as hunters and shifting agriculture before they can do significant damage to the ecosystem, and dealing with the offenders using non-violent methods. The project filed team has worked with the same techniques and in many situations along-side OFI to continue this approach so that these instances have been reduced and have been effectively managed when they occurred.

The Project does not and has not benefited from any illegal activity.

3 CLIMATE

3.1 Monitoring GHG Emission Reductions and Removals

3.1.1 Data and Parameters Available at Validation

Data Unit / Parameter:	CF
Data unit:	Dimensionless

Description:	Carbon fraction of dry matter
Source of data:	IPCC default value = 0.50
Value applied:	0.50
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in multiple carbon calculations to convert biomass to carbon as detailed in VM0004.
Any comment:	

Data Unit / Parameter:	$A_{B,\ it,logged}$
Data unit:	Ha
Description:	Area of land logged under the baseline scenario for stratum i, in time t
Source of data:	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
Value applied:	Rate 2,800 ha yr^{-1} (stratum i, time t)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Timber Extraction spreadsheet
Any comment:	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.

Data Unit / Parameter:	P
Data unit:	Dimensionless
Description:	Percent of harvest industrial roundwood going into long term wood products
Source of data:	Industry standard value: FAO 1995. FAO Yearbook: Forest products. FAO For. Serv. No. 28, FAO, Rome, 422 p.
Value applied:	0.25
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Timber Extraction spreadsheet
Any comment:	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)

Data Unit / Parameter:	AP
Data unit:	m^2
Description:	Plot Area
Source of data:	Aerial plot measurement
Value applied:	10,000
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	parameter created but not used
Any comment:	Equation 38 not used as the allometric method was not selected as allowed by the methodology (p. 20); Equation 32 not used because different AIM Step calculations were made.

Data Unit / Parameter:	Φ
Data unit:	g cm^3
Description:	Volume-weighted average wood density
Source of data:	Literature Value: Reyes, Brown, Chapman and Lugo (1992) mean wood density for tropical Asia represented by 428 species, SE = 0.007
Value applied:	0.57 (SD = 0.145)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Biomass Burning Spreadsheet
Any comment:	Equation 68 used for leakage calculation; Equation 34 was not used (since BEF method not selected as allowed by the methodology (p. 20); Equation 8 was not used because different AIM Step calculations were made.

Data Unit / Parameter:	$PB_{BB,it}$
Data unit:	Dimensionless
Description:	Average proportion of $C_{B,AC,it}$ burnt under the baseline scenario in stratum i, time t
Source of data:	methodology (p. 16)
Value applied:	1
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Biomass Burning -BL E51
Any comment:	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 in this methodology the proportion burned in the baseline $P_{BBB,it}$ is assumed to be equal to 1.”

Data Unit / Parameter:	CE
Data unit:	Dimensionless
Description:	Average biomass combustion efficiency
Source of data:	IPCC default =0.50
Value applied:	0.50
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Biomass Burning spreadsheet
Any comment:	

Data Unit / Parameter:	$A_{cleared\ B,it}$
Data unit:	Ha
Description:	Average annual area of deforestation by the baseline agent of deforestation for the 5 years prior to project implementation
Source of data:	GPS coordinates and/or remote sensing data and or/legal parcel records
Value applied:	Rate 2,800 ha yr^{-1} (stratum i, time t)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	
Any comment:	The expected annual rate of conversion was determined by analyzing historical rate of conversion by the baseline agent.

Data Unit / Parameter:	N/C ratio
Data unit:	Dimensionless
Description:	Nitrogen-carbon ratio
Source of data:	IPCC default = 0.01
Value applied:	0.01

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	used in Biomass Burning spreadsheet
Any comment:	

Data Unit / Parameter:	ER_{N2O}
Data unit:	t CO_2-e (t C)$^{-1}$
Description:	Emission ratio for N_2O
Source of data:	IPCC default value =0.007
Value applied:	0.007
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	see Biomass Burning spreadsheet
Any comment:	

Data Unit / Parameter:	ER_{CH4}
Data unit:	t CO_2-e (t C)$^{-1}$
Description:	Emission ratio for CH_4
Source of data:	IPCC default value = 0.012
Value applied:	0.012
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	see Biomass Burning spreadsheet
Any comment:	

Data Unit / Parameter:	GWP_{N2O}
Data unit:	t CO_2-e (t N_2O)$^{-1}$
Description:	Global Warming Potential for N_2O
Source of data:	IPCC 4th Assessment Report

Value applied:	298
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	see Biomass Burning spreadsheet
Any comment:	Used in Equation 15. Equation 54 was not used – as palm oil plantations operate on a 25-30 year timeframe, emissions from harvest rotations were not considered in baseline estimation. This is conservative.

Data Unit / Parameter:	GWP_{CH4}
Data unit:	t CO2-e $(t\ CH_4)^{-1}$
Description:	Global Warming Potential for CH4
Source of data:	IPCC 4th Assessment Report
Value applied:	25
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	see Biomass Burning spreadsheet
Any comment:	Used in Equation 16. Equation 55 is 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.

Data Unit / Parameter:	DBH
Data unit:	cm
Description:	diameter at breast height of tree
Source of data:	Field Measurement.
Value applied:	See Carbon Survey Report data
Justification of choice of data or description of measurement methods and procedures applied	

Purpose of the data:	
Any comment:	Not used in Equation 24 and 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.

Data Unit / Parameter:	$A_{itplanted}$
Data unit:	Ha
Description:	area of biomass growth on future land use in the baseline scenario in stratum *i* at time *t*
Source of data:	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
Value applied:	Rate 2,800 ha yr^{-1}
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	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.
Any comment:	Strata based on concession boundaries. Time based on staggered concession development and planting north to south.

Data Unit / Parameter:	age_{peak}
Data unit:	Years
Description:	age of stand at peak production
Source of data:	Literature values: Data reported in Cannell M.G. R. 1982. World Forest Biomass and Primary Production Data. Academic Press. London. 391 pp.

Value applied:	14
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	See discussion Baseline Report Oil Palm Growth Model Data
Any comment:	

Data Unit / Parameter:	$D_{B,,drain,it}$
Data unit:	cm
Description:	average depth of peat drainage or average depth to water table under the baseline scenario in stratum i, time t
Source of data:	Methodology default value = 100 cm
Value applied:	100
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	See Peat Drainage spreadsheet
Any comment:	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.

Data Unit / Parameter:	$A_{B,drain,it}$
Data unit:	Ha
Description:	area of drainage impact under the baseline scenario in stratum i, time t
Source of data:	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
Value applied:	See Peat Drainage spreadsheet

Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	
Any comment:	Note peat drainage emissions are cumulative, expanding to cover the full extent of concessions, then continuing over the life of the project.

Data Unit / Parameter:	D_{peat}
Data unit:	Meters
Description:	average depth of peat in project area
Source of data:	Field Measurements
Value applied:	4.3
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	See Carbon Survey Report
Any comment:	

Data Unit / Parameter:	$D_{B,burn,it}$
Data unit:	cm
Description:	Depth of peat burned under the baseline scenario in stratum i at time t;
Source of data:	Literature value: Couwenberg et al. (2009) cited in the methodology p. 36
Value applied:	34cm
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	
Any comment:	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.

Data Unit / Parameter:	$A_{B,burn,it}$
Data unit:	Ha
Description:	Area of peat burned under the baseline scenario in stratum i at time t;
Source of data:	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
Value applied:	See Peat Burning spreadsheet
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	
Any comment:	

Data Unit / Parameter:	BD_i
Data unit:	g cm^{-3} = t m^{-3}
Description:	Bulk density of peat in stratum i (g cm3 = t m3)
Source of data:	Default value
Value applied:	0.1505
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Site specific values of peat bulk density are applied to all peat vegetation strata in the project area. Ex-post this value will be listed as the default value for all peat strata until (as required by the methodology) new data become available.

Any comment:	As this site specific value of peat bulk density if higher than the default value it is conservative to use it in the ex-post scenario.

Data Unit / Parameter:	EF_{CO2}
Data unit:	g CO_2 (t peat)$^{-1}$
Description:	CO_2 emissions from the combustion of peat
Source of data:	Literature value. Muraleedharan et al. (2000) cited in the methodology p. 38
Value applied:	185,000
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Peat Burning spreadsheet
Any comment:	

Data Unit / Parameter:	EF_{CH4}
Data unit:	g CH_4 (t peat)$^{-1}$
Description:	CH4 emissions from the combustion of peat
Source of data:	Literature value
Value applied:	5,785 g/ton peat
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Peat Burning – BL worksheet cell E6
Any comment:	

Data Unit / Parameter:	LDF
Data unit:	t C m^{-3}
Description:	Logging Damage Factor for calculating the biomass of dead wood created during logging operations per cubic meter extracted
Source of data:	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.
Value applied:	0.37
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Used in Equation 68 of VM0004
Any comment:	

Data Unit / Parameter:	PML_{FT}
Data unit:	%
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:	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.
Value applied:	< 0.20
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	
Any comment:	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.

Data Unit / Parameter:	$V_{B,it}$
Data unit:	m^3
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:	Source of data same as biomass logged parameter.
Value applied:	Embedded in Equation 68, see biomass burning spreadsheet
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Note that this volume does not include logging slash left onsite. Extracted volumes reported are gross volumes removed.
Any comment:	

Data Unit / Parameter:	PMP_i
Data unit:	%
Description:	Merchantable biomass as a proportion of total aboveground tree biomass for stratum i within the project boundaries
Source of data:	unpublished data from Mawas, Winrock 2008
Value applied:	Mean 0.36, SD 0.169
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Same as B logged (Biomass Extracted as Merchantable Timber >30cm in Timber Extraction spreadsheet)
Any comment:	Mawas data provides complete dataset applicable to Rimba Raya project site. Average proportion of merchantable timber across 93 logging gaps

Data Unit / Parameter:	$HistHa_i$
Data unit:	Ha
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:	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
Value applied:	6113.7
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	See discussion Baseline Report
Any comment:	

Data Unit / Parameter:	$A_{defLK,it}$
Data unit:	Ha
Description:	The total area of deforestation by the baseline agent of the planned deforestation in stratum i at time t
Source of data:	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
Value applied:	Not calculated as of year 1 (no leakage)
Justification of choice of data or description of measurement methods and procedures applied	
Purpose of the data:	Legal records will include government permits to deforest including concession licenses.
Any comment:	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.

3.1.2 Data and Parameters Monitored

Data Unit / Parameter:	$N_{gapsP,\ it}$
Data unit:	Dimensionless
Description:	Number of logging gaps detected in stratum i, time t in the project area
Source of data:	Remote sensing and field data
Description of measurement methods and procedures to be applied:	Patrols frequently visit known forest access points to discourage and eliminate logging. When logging events are found, each stump is counted and the diameter of the stump measured to compare with the default 'logging gap' estimate of biomass loss. If number of logging gaps are unable to be estimated in the field, the procedures described in PD deviation 4 shall be applied.

Frequency of monitoring/recording:	Revisit annually.
Value monitored:	The number of gaps (i.e. individual trees removed) in each monitoring period
Monitoring equipment:	LandSAT images GPS Diameter tapes
QA/QC procedures to be applied:	
Calculation method:	Methodology Equation
Any comment:	

Data Unit / Parameter:	$L_{log,tr,tk}$
Data unit:	M
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:	Field visit
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$D_{bottom,tr,ik}$
Data unit:	Cm
Description:	Diameter at the stump end of log extracted from timber tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$D_{top,tr,ik}$
Data unit:	Cm
Description:	Diameter at the crown end of log extracted from timber tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	ϕ_i
Data unit:	t m^{-3}
Description:	Wood density of extracted log in stratum *i*
Source of data:	Literature Value: Reyes, Brown, Chapman and Lugo (1992) mean wood density for tropical Asia represented by 428 species, SE = 0.007
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.57 (SD = 0.145)
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	CF
Data unit:	Dimensionless
Description:	Carbon fraction of dry matter (extracted log)
Source of data:	IPCC default = 0.50
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.50
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	$D_{s,tr,ik}$
Data unit:	Cm
Description:	Diameter of the stump of the logged timber tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$H_{tr,ik}$
Data unit:	M
Description:	Height of tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure -

	Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$D_{pce\text{-}b,tr,ik}$
Data unit:	Cm
Description:	Diameter of bottom end of piece left from timber tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$L_{pce,tr,ik}$
Data unit:	M
Description:	Length of piece left from timber tree tr in stratum i, gap k
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$D_{pce\text{-}t,tr,ik}$
Data unit:	Cm
Description:	Diameter of top end of piece pce left from timber tree tr in stratum i, gap k: cm
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$D_{logging\ drain,it}$
Data unit:	Cm
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:	Field measurements
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

Data Unit / Parameter:	$A_{logging\ peatimpact,it}$
Data unit:	Ha
Description:	Area of drainage impact in stratum i, time t
Source of data:	
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	
Value monitored:	
Monitoring equipment:	
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire and Logging Gaps
Calculation method:	After consulting with peat expert apply buffer in

	GIS software
Any comment:	

Data Unit / Parameter:	CE
Data unit:	Dimensionless
Description:	Average biomass combustion efficiency
Source of data:	IPCC default =0.50
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.50
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	$MC_{burnedP,AG,it}$
Data unit:	t C ha^{-1}
Description:	Estimated aboveground carbon stock after burning under the project case for stratum i, time t
Source of data:	Conservatively assume complete loss of aboveground biomass and no regrowth.
Description of measurement methods and procedures to be applied:	Annual remote sensing of burnt areas used to estimate aboveground biomass loss. Done in conjunction with annual landcover change analysis and monitoring of MODIS hotspots.
Frequency of monitoring/recording:	
Value monitored:	n/a (not measured)
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Area burnt in each strata multiplied by the biomass estimate for that strata
Any comment:	

Data Unit / Parameter:	N/C ratio
Data unit:	Dimensionless
Description:	Nitrogen-carbon ratio
Source of data:	IPCC default=0.01
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.01
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	ER_{N20}
Data unit:	t CO_2-e (t C)$^{-1}$
Description:	Emission ratio for N_2O
Source of data:	IPCC default value=0.007
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.007
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	ER_{CH4}
Data unit:	t CO_2-e (t C)$^{-1}$
Description:	Emission ratio for CH_4
Source of data:	IPCC default value = 0.012
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	0.012
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	Used in Equation 115 on AB Biomass Burn tab and Equation 119 on Peat Burn tab of ex-post Accounting Model

Data Unit / Parameter:	GWP_{N2O}
Data unit:	t CO_2-e (t N_2O)$^{-1}$
Description:	Global Warming Potential for N_2O
Source of data:	IPCC 4th Assessment
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	298
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	Used in Equation 111 on AB Biomass Burn tab

Data Unit / Parameter:	GWP_{CH4}
Data unit:	t CO_2-e (t CH4)$^{-1}$
Description:	Global Warming Potential for CH_4
Source of data:	IPCC 4th Assessment
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	25
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	$A_{p,burn,it}$
Data unit:	Ha
Description:	Area burned in stratum i, time t in the project area
Source of data:	Field measurements or using high resolution digital aerial imagery
Description of measurement methods and procedures to be applied:	GIS analysis of satellite imagery and ground-truth data
Frequency of monitoring/recording:	Once during 2010- 2013. Annual from 2013.
Value monitored:	Array
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	
Any comment:	High resolution images were not able to be accessed for effected areas due to cloud cover in this monitoring period. Therefore ground trothing of medium resolution LandSAT was undertaken.

Data Unit / Parameter:	$D_{P,burn,it}$
Data unit:	Cm
Description:	Depth of peat burned under the project scenario in stratum i at time t:
Source of data:	Methodology default value
Description of measurement methods and procedures to be applied:	The upper range of the methodology default value was applied (i.e. 55cm). This was validated with limited field measurements and further supported by relevant peer reviewed research in the same region as the Project area.
Frequency of monitoring/recording:	NA
Value monitored:	55cm
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	Methodology literature value applied and validated in the field.
Any comment:	NA

Data Unit / Parameter:	BD_i
Data unit:	g cm^{-3} = t m^{-3}
Description:	Bulk density of peat in stratum i
Source of data:	Field work conducted in project area
Description of measurement methods and procedures to be applied:	
Frequency of monitoring/recording:	This parameter is not monitored but rather applied consistently throughout the Project.
Value monitored:	Value to be applied is: 0.1505 g cm^{-3} = t m^{-3}
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	Site specific values of peat bulk density are applied to all peat vegetation strata in the project area. Ex-post this value will be listed as the default value for all peat strata until (as required by the methodology) new data become available.
Any comment:	As this site specific value of peat bulk density if higher than the default value it is conservative to use it in the ex-post scenario.

Data Unit / Parameter:	EF_{CO2}
Data unit:	g CO_2 (t peat)$^{-1}$
Description:	CO_2 emissions from the combustion of peat
Source of data:	Literature value: Muraleedharan et al. (2000) cited in Methodology p. 38
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	185,000 g CO_2 (t peat)$^{-1}$
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	$EFCH_4$
Data unit:	g CH_4 (t peat)$^{-1}$
Description:	CH4 emission from the combustion of peat
Source of data:	Literature value: Muraleedharan et al. (2000) cited in Methodology p. 38
Description of measurement methods and procedures to be applied:	NA
Frequency of monitoring/recording:	NA
Value monitored:	5,785 g CH_4 (t peat)$^{-1}$
Monitoring equipment:	NA
QA/QC procedures to be applied:	NA
Calculation method:	NA
Any comment:	NA

Data Unit / Parameter:	$A_{P, LCC, it}$
Data unit:	Ha
Description:	Area that underwent land cover change in stratum i, monitoring year t:
Source of data:	High resolution digital aerial imagery or field measurements
Description of measurement methods and procedures to be applied:	GIS and satellite image analysis
Frequency of monitoring/recording:	Twice between 2010 and 2013. Annual from 2013 onwards.
Value monitored:	Array
Monitoring equipment:	
QA/QC procedures to be applied:	Orthorectifed images must be used
Calculation method:	
Any comment:	

Data Unit / Parameter:	$A^{LCCn}_{peatimpact,it}$
Data unit:	Ha
Description:	Area of drainage impact due to land cover change in stratum i, monitoring year t
Source of data:	Medium/high resolution imagery combined with field measurements as appropriate.
Description of measurement methods and procedures to be applied:	Calculated in GIS using the geoprocessing buffer function
Frequency of monitoring/recording:	
Value monitored:	Array
Monitoring equipment:	
QA/QC procedures to be applied:	
Calculation method:	The method involves mapping the extent of the drainage and buffering by anticipated area of impact based on available science/expert opinion at the time. The area under the buffer that occurs inside the Carbon Accounting Area is considered the area of drainage impact.
Any comment:	

Data Unit / Parameter:	$D_{LCC\ drain,it}$
Data unit:	Cm
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:	Field measurements or estimated from literature values if measurements not available.
Description of measurement methods and procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Frequency of monitoring/recording:	At impact
Value monitored:	Even though the description state the average should be used, the maximum drainage depth recorded of 60cm was applied.
Monitoring equipment:	Tape Measure and Measuring pole
QA/QC procedures to be applied:	Refer to Standard Operating Procedure - Monitoring for Fire, Logging Gaps and Land Cover Change
Calculation method:	
Any comment:	

3.1.3 Monitoring Plan

A monitoring plan was developed to collect relevant climate data. Combining early warning, ground truthing and remote sensing, the monitoring plan tracks key indicators to report on the integrity of the Reserve's carbon stocks which allows the project proponents to adapt the Reserve's management plan to changing conditions.

3.1.3.1 Purpose

The purpose of the Rimba Raya Biodiversity Reserve Project monitoring plan is to confirm that the estimates of ex-ante 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 activities enables the project proponent to objectively identify gaps and deficiencies and use this information to improve both monitoring and management of the project.

3.1.3.2 Monitoring Organizational Structure, Responsibilities, Competencies

The monitoring plan has been implemented by the project proponent, InfiniteEARTH, and Rimba Raya staff in conjunction with Orangutan Foundation International (OFI), and ecoPartners LLC.

InfiniteEARTH 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". 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. During this monitoring period, InfiniteEARTH has contributed to the project's climate monitoring program through forest protection and monitoring, carbon monitoring, project management and carbon sales. Day to day climate monitoring activities are performed by Rimba Raya field staff operating out of the company's Sampit office and with support from the Jakarta office.

OFI and ecoPartners have also contributed to the monitoring of the project's climate related activities. OFI is a nonprofit organization dedicated to the conservation of wild orangutans and their rainforest habitat in Indonesia and Malaysia. Led by conservation pioneer and the world's foremost authority on the orangutan Dr. Biruté Mary Galdikas, OFI has had a strong presence in the region since 1986 and contributes to the project's climate monitoring program by providing forest protection and ground surveying.

ecoPartners LLC is a forestry-based company that works with project developers, forest owners and verification bodies to build successful carbon offset projects. ecoPartners possesses expertise in the technical aspects of project design, planning and development including biometrics, accounting methodologies and remote sensing. ecoPartners has extensive experience validating and verifying projects under multiple carbon standards, including both VCS and CCB. During this monitoring period, ecoPartners has provided technical input with remote sensing, land use change analysis and project documentation as well as guidance support through verification.

InfiniteEARTH and its partners aptly possess the expertise, skills and experience that were needed to successfully carry out climate monitoring during this monitoring period.

3.1.3.3 Methods for generating, recording, storing, aggregating, collating and reporting data on monitored parameters

A key feature of the Rimba Raya climate monitoring plan is to employ spatial data and tools to systematically monitor land cover change in the project area and project buffer zone. 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 has improved

the efficiency and effectiveness of directed field visits, which has been 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 the project partner Orangutan Foundation International, in the project area since 2004. Rimba Raya monitoring builds on the existing field reconnaissance, forest survey and GIS team training, protocols and monitoring systems that have been in place for many years. During this monitoring period, the monitoring practices followed in this structure.

The climate monitoring approach has effectively been divided into two components: 1. Proactive Patrols and 2. Reactive targeted ground surveys.

3.1.3.3 Proactive Patrols

Climate monitoring data has been generated throughout the monitoring period from ground patrols carried out by the Rimba Raya staff based at the Sampit office and in the three field units. During these patrols, staff have recorded any findings with GPS tagged photos and descriptions in reports that are generated on return to the office. All information is stored at the office and copies are provided to the Project Manager, Asia Pacific Consulting Solutions during regular progress reporting meetings.

3.1.3.3 Reactive targeted ground surveys

Following the annual assessment of land cover analysis from remote sensing data, areas may be identified for targeted ground surveys (i.e. burnt areas, or suspected leakage activities). GPS points of the areas to visit are provided by ecoPartners to the Rimba Raya field staff through Project Manager, Asia Pacific Consulting Solutions. The field crew then apply the relevant standard operating procedure to collect data and report back on the field findings back to The Project Manager. The data/photos and reports are stored both in the Sampit office and a copy is provided to Asia Pacific Consulting Solutions to store off site.

The aggregation of climate-related data into the monitoring report is carried out by ecoPartners. The schedule for collecting data on the various monitoring components can be seen in the next section.

3.1.3.4 Monitoring Components

Annual monitoring activities consisted of remote sensing and GIS analysis, routine field patrols and directed field sampling in areas prioritized by systematic site assessments. The monitoring system took a hierarchical approach starting with medium resolution Landsat (30m) satellite imagery, then high resolution (3m) Planet Scope satellite imagery from Planet Labs, and finally with ground patrols. There are eight major components of monitoring: three that are focused on project conditions and forest protection (Table 8) and five that are focused on annual land change assessment for carbon accounting (Table 9).

Monitoring has targeted land cover 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 followed requirements of the methodology.

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

Land cover change monitoring used readily available satellite imagery such as Landsat and was monitored semi-annually to ensure complete temporal and spatial coverage of the project management zone. In addition, high spatial resolution imagery or aerial surveys were collected for the carbon accounting area to record forest condition and identify forest gaps. Detected changes were recorded and investigated using image analysis techniques followed by survey patrols. These patrols were deployed as needed depending on the frequency and scale of deforestation and were used to record any new logging, canal building or other deforestation activity as described in the methodology.

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

The project boundary and stratification were 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 was monitored for new drainage activities that could potentially impact peat emissions inside the project boundary.

Stratification of the project area (land cover classification) was monitored periodically as new data became 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) was conducted to verify the applicability of the ex-ante stratification, and variables that influence the strata. Annual land cover map updates are also used to facilitate cost-effective, consistent and accurate monitoring of project carbon stock changes during the crediting period.

Baseline net GHG emissions did 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.

Leakage was assumed to occur as a result of economic activity displacement (e.g. shifting pattern of oil palm conversion) and it was this displaced activity that was monitored and accounted in order to adjust net GHG emissions avoided by the project. Market leakage represented a one-time deduction to baseline emissions. Displacement leakage was monitored each crediting period. Monitoring included 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 was conducted in accordance with the methodology.

Monitoring Component	Activity and Years	Times and periods	Detection frequency	Remote sensing data source	Field survey frequency	Reporting frequency
Boundary	Mark in field	Year-end	Non-specific	n/a	1 field survey annually	Annually
	Patrol Yr1-Yr30		Annually	Landsat 30m satellite imagery annually.		
Stratification	Land cover classification (Yr1 develop model, Yr2-3 refine model, Yr 4-30 apply standard model)	Year-end	Annually	Landsat 30m satellite imagery annually.	1 field survey annually	Annually
				PlanetScope 3m satellite imagery		
Forest Protection	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	Landsat 30m satellite imagery annually.	1 patrol quarterly and as-needed	Quarterly

Table 8. Monitoring Components: Project Conditions and Forest Protection

Monitoring Component	Activity and Years	Times and periods	Detection frequency	Remote sensing data source	Field survey frequency	Reporting frequency
Land change	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 PlanetScope 3m satellite imagery	2-3 field surveys annually	Annually
Logging	Detection and area calculation of deforestation caused by logging Detection and survey of transport canal-building associated with logging	Year-round with increased activity during wet season	Semi-annually	Landsat 30m for detection combined with field work PlanetScope 3m satellite imagery	2-3 field surveys annually	Annually
Fire	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) Landsat 30m for detection combined with field work PlanetScope 3m satellite imagery	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	New permit activity	Year-round	Quarterly	n/a	n/a	Annually
	Spatial analysis of new palm oil in areas of possible leakage	End of year	Annually, for first 5 years of project	Landsat 30m for palm oil boundary interpretation and delineation	none	Annually

Table 9. Monitoring Components: Land Change Assessment for Carbon Accounting

3.1.3.5 The implementation of sampling approaches

Monitoring was 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. Permanently constructed guard posts were 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 recorded daily reports into a permanent log book. The GIS team led by a GIS manager collected remotely sensed imagery and conducted monitoring analyses in the office. These analyses were provided to the field manager who used this information to plan and schedule field surveys. The field manager prepared transportation and logistics and handled field budgets. Field team leaders directed staff in the field for conducting surveys, recording data and delivering data back to the GIS team who conducted data entry.

Fire monitoring was similarly implemented with a specialized fire team manager and trained fire team. Field reports were written by field team leaders and provided to the project coordinator, as were GIS data and maps. The project coordinator used this information to compile quarterly and annual reports and conduct or supervise the carbon accounting that had to be reassessed every year prior to verification.

The QA/QC plan was 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 was improved and detailed in Years 2 and 3 as project monitoring systems were refined. The project coordinator was responsible for training staff on QA/QC plan updates.

The project coordinator also ensured the QA/QC plan was followed and was responsible for updating SO Managing. Data quality was key to conducting successful monitoring and was 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, for forest protection activities and the QA/QC plan were employed by project staff and updated annually as needed. These can be made available for verification. Further details pertaining to QA/QC are included in section 6 of this report.

The non-permanence risk analysis was conducted by the project developer the time of verification and is made available for verification.

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 was 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.

Project data were 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, were stored and maintained for each 10-year crediting period. More information about data storage is included in section 6 of this report.

3.1.4 Dissemination of Monitoring Plan and Results (CL3.2)

Field monitoring occurs within each field unit on a minimum of an annual basis, and in some locations where there is concern for, or a history of encroachment, it can be as frequently as weekly or daily. Monitoring trip reports are kept at the field unit level for each trip and compiled by field unit manager as a summary to be provided to the Sampit office on a monthly basis. APCS uses these reports along with work progress reports to provide a monthly report to InfiniteEARTH and RRC Jakarta office and to prepare the annual monitoring plan. Project data are 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. Any changes in these locations are listed in annual verification reports.

In accordance with VCS, 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. 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. Project data are managed by the Rimba Raya Conservation (RRC) project coordinator in conjunction with the GIS manager to ensure security, accessibility and long-term storage. More information about data storage is included in section 6 of this report.

The reports are available by anyone upon request and actively disseminated to all stakeholders on an annual basis prior to any upcoming audit. Summaries of the report are provided to stakeholders at community meetings that are held prior to verification events.

3.2 Quantification of GHG Emission Reductions and Removals

3.2.1 Baseline Emissions

In 1996, the Tanjung Puting National Park border was set and comprised 396,000ha. Each province and district in Indonesia is required to conduct ten-year spatial plans and the 2003 plan for Central Kalimantan indicated a different, smaller border. This revision to the border of the Park was agreed to by the Minister of Forestry in 2005. In the buffer area east of the park in what is now the Rimba Raya concession two timber concessions selectively logged the area during the 1980s and 1990s, PT Bina Samaktha in the northeast portion and PT Mulung Basidi in the southeast. The companies stopped operations in 1998 and 2000, respectively. Since then some of the easily accessed forest has been illegally selectively logged by nearby community members.

In 2004, five oil palm estates were formally proposed to the Bupati and the Governor that partially occupy the ex-timber concessions adjacent to the Park. By 2007, all five of these proposed estates had received the initial stage of oil palm permits from the Seruyan Bupati with the northernmost estate also being granted the estate license (HGU – Indonesian acronym). Following HGU designation, the northernmost estate was rapidly converted to oil palm plantation. This concession, managed by PT Kharisma Unngul Centratama became operational in 2007.

The baseline emissions were calculated ex-ante and are presented in Table 10 below.

Yr of Project	Em. from timber (t CO_2-e)	Em. from biomass burning (t CO_2-e)	Growth of oil palm (t CO_2-e)	Em. from peat burning (t CO_2-e)	Em. from peat drainage (t CO_2-e)	Total CO_2-e baseline emissions (t CO_2-e)	Market Leakage Deduction (t CO_2-e)	Total emissions after Market Leakage deduction (t CO_2-e)	Total cumulative CO_2-e emissions (t CO_2-e)
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	225,690	(467,616)	396,528	4,915,015	5,069,617	0	5,069,617	24,266,160
7	0	0	(635,119)	0	4,915,015	4,279,896	0	4,279,896	28,546,056
8	0	0	(776,046)	0	4,915,015	4,138,969	0	4,036,912	32,582,968
9	0	0	(888,679)	0	4,915,015	4,026,336	0	4,128,393	36,711,361
10	0	0	(934,685)	0	4,915,015	3,980,330	0	3,980,330	40,691,691

Table 10: Calculations for Baseline Emissions in the Ex-Ante Scenario

3.2.2 Project Emissions

Project Emissions from three sources (selective logging- degradation, fire and deforestation) are calculated in accordance Equations 89 and 90 of VM0004.[1]

$$C_{PRJ} = \sum_{t=1}^{t^*} \sum_{i=1}^{m_{PS}} C_{P'it}$$ VM0004 – 89

$$C_{P'it} = E_{P'it}^{logging} + E_{P'it}^{fire} + E_{P'it}^{LCC}$$ VM0004 – 90

where;

C_{PRJ} sum of emissions that occur within the project boundary as a result of emissions that were unanticipated and/or unable to be avoided by project activities; tCO_2-e

$C_{P'it}$ sum of emissions that occur within the project boundary in stratum *i* at time *t* as a result of emissions that were unanticipated and /or unable to be avoided by project activities; tCO_2-e

$E_{P'it}^{logging}$ GHG emissions due to logging in stratum *i*, time *t*; tCO_2-e

$E_{P'it}^{fire}$ GHG emissions due to fire in stratum *i*, time *t*; tCO_2-e

$E_{P'it}^{LCC}$ GHG emissions due to land use/land cover change in stratum *i*, time *t*; tCO_2-e

i 1,2,3,…..m_{PS} strata

t 1,2,3,…t* years

This calculation is performed in the monitoring calculation spreadsheet on Tab "Summary Emissions Table", column M.

3.2.2.1 Estimation of GHG emissions due to selective logging ($E_{P,it}^{logging}$)

The GHG emissions attributable to logging within the project boundary over the monitoring period are estimated is accordance with Equation 91 of VM0004.

$$E_{P,it}^{logging} = \left(N_{P,it}^{gaps} \times EF_{logging,i}\right) + E_{drainage,it}^{logging}$$ VM0004 – 91

where;

$E_{P,it}^{logging}$ GHG emissions due to logging in stratum *i*, time *t*; tCO_2-e

$N_{P,it}^{gaps}$ number of logging gaps detected in stratum *i*, *time t*, in the project area; dimensionless

$EF_{logging,i}$ average logging emission factor for stratum *i*,; tCO_2-e (logging gap)$^{-1}$

1 See page 71 of VM0004.

$E^{logging}_{drainage,it}$ CO_2 emissions from peat drainage in stratum *i*, time *t*; tCO_2-e

This calculation is performed in the monitoring calculation spreadsheet on Tab "Summary Monitoring Emissions" in column B.

In accordance with the methodology the Logging Gap Emissions Factor was estimated at the beginning of the project and is described in the validated Monitoring Plan. Therefore only the activities involved with monitoring existing canals and identifying new areas of illegal logging in the Carbon Accounting Area are covered in this section.

Survey and calculation methods comprised five steps:

Step 1: Detect all logging gaps

In accordance with the methodology the logging gaps identified in the baseline were revisited in 2017 to survey the state and extent of ongoing logging in these areas.

Step 2. Conduct surveys of timber extracted at logging sites

During field survey it was found no new canals had been built, and any existing canals had not been extended nor had any new trees been extracted from pre-existing log sites. Refer to supporting reports which can be made available on request.

At the new logging gaps identified no new canals had been dug but trees had been extracted. During this monitoring period, field crews were able to identify an area of logging activity within the project area, however, they were unable to estimate the total number of logging gaps within that area of impact. Due to a lack of data, a conservative calculation of logging gaps was applied by assuming that the entire area of impact had been logged. For the full calculation approach, see PD deviation 4 in section 2.2.4 of this monitoring report.

Step 3. Estimate an average logging emissions factor for each stratum

There were 2,258 logging gaps estimated in the Project area in the monitoring period. **The emissions associated with the logging gaps totaled 12,415 tCO_2-e.**

This calculation is performed in the monitoring calculation spreadsheet on Tab "Timber Extraction 2014_17", column O; cell 15.

Step 4. Calculate CO_2 emissions from peat drainage

No new canals were identified in the Project area. The emissions from peat drainage were based on the tracklogs of travelling the extent of the canals in 2014[2] (during the previous monitoring period) combined with the applied buffer of 500m to determine the area of impact from the peat drainage. This approach is very conservative as the field visits to the existing logging canals indicated that these canals are no longer in use and are being overgrown with vegetation.

Soil Classification	Stratum	Canal 1 Area (ha)	Canal 2 Area (ha)	Canal 3 Area (ha)	Total (ha)
non-peat	Data gap	0	0	0	0
non-peat	Coastal forest	0	0	0	0
non-peat	Grass	0	0	0	0
non-peat	Low, sparse veg.	0	29	0	29
peat	Peat swamp forest	318	44	121	**483**
non-peat	Riparian forest	0	0	0	0
peat	Shrubland	11	264	100	**374**
non-peat	Water	0	21	20	40
non-peat	Wetlands	49	47	109	205
	Total	**378**	**404**	**349**	**1132**

Table 11: Buffer Area around Existing Canals (not extended in current Monitoring Period)

The total area of peat soil impacted per year was determined to be **857 hectares.**

The following equations were subsequently applied:

$$E^{logging}_{drainage,it} = A^{logging}_{dd,itpeatimpact,it} \times ME^{logging}_{dd,it}$$ VM0004 – 107

and:

$$ME^{logging}_{dd,it} = f\left(D^{logging}_{drain,it}\right)$$ VM0004 – 108

where;

$E^{logging}_{drainage,it}$	CO_2 emissions from peat in stratum i at time t; t CO_2-e
$A^{logging}_{peatimpact,it}$	area of drainage impact in stratum i, time t; ha
$ME^{logging}_{dd,it}$	mean CO_2 emissions from drained peat in stratum i, time *t*; t CO_2-e ha^{-1}
$D^{logging}_{drain,it}$	average depth of peat drainage or average depth of water table in drained area of stratum i, time t during the dry season, cm

Ex-post calculations relied on the linear drainage function presented in the VCS PD, using the methodology default value of .91 t CO_2 ha^{-1} y^{-1} cm $(depth)^{-1}$.

$$F(^{DLCC})^{=}.91*D_{drain.it}$$ p. 78 of methodology

The total emissions from logging canals in the project area was subsequently estimated to be roughly 42,889 t CO_2-e yr^{-1}, which was lower than the last reporting period due to adjustments

[2] Refer to methodology page 78 Step 7 which states that the canals should be regularly monitored to account for changes in total length and potential expansion.

in the emissions factor as well as the correction of emissions estimates in the accounting model. Over the three year monitoring period this totals 127,728 t CO_2e.

Calculations are performed in the calculation spreadsheet on the tab titled "LoggingDrainage 2014-2017, column G; row 20"

Step 5. Calculate GHG emissions attributable to logging

The total emissions attributable to logging in the Project area was determined to be 140,143 t CO_2-e.

The summation calculation is performed in the calculation spreadsheet on the tab titled "SummaryMonitoringEmissions, column B; row71"

3.2.2.2 GHG Emissions due to fire (E_{it}^{fire})

All fires that occur within the project boundary must be reported over the life of the Project and the associated GHG emissions from both biomass burnt and peat burnt resulting from these fires must be accounted for.

Step 1: Determine presence/absence of burning and monitor area burnt within project boundary

Monitoring for fire using Landsat and PlanetScope images was conducted for the period 2014 – 2017.

According to the methodology, if fires are detected within the Project boundary (or within a 1km buffer of the project boundary[3]) high resolution or georeferenced ground measurements shall be collected over these areas and the location of the area of all fire scars shall be calculated and recorded.

During the monitoring period a total of 11,326.7 hectares were burnt within the carbon accounting area. Roughly 157 of those hectares were areas that were burned twice during the monitoring period, and the emissions from peat on those hectares were accounted for in the accounting model.

Land cover class	Area burned 2014-2017
Data gap	0.0
Coastal forest	17.0
Grass	117.4
Low, sparse veg.	687.5
Peat swamp forest	6,083.7
Riparian forest	23.7
Shrubland	3,650.1
Water	0.0
Wetlands	747.0
Sum	**11,326.7**

Table 12: Burned area per land cover class for the years 2014 – 2017.

Georeferenced ground measurements were collected at a number of burnt areas. Field visits to these areas confirmed that all visited locations had experienced fire as expected.

Step 2: Estimate an average fire emissions factor ($EF_{fire,it}$)

[3] There is no further guidance on how to treat fires detected in the 1km buffer around the project area. Therefore we have tracked them but have not accounted for GHG emissions form these fires as they are outside the Carbon Accounting Area.

Emissions factor from fire include emissions from both biomass and peat burn and are estimated by applying Equation 110 from the methodology.

$$EF_{fire,it} = EF_{P,BiomassBurn,it} + EF_{P,PeatBurn,it}$$ VM0004 – 110

where:

$EF_{fire,it}$	average fire emissions factor for stratum *i*, monitoring year t, tCO_2-e ha^{-1} burnt
$E_{P,BimassBurn,it}$	total increase in CO_2-e emission as a result of aboveground biomass burning in stratum *i*, monitoring year *t*; t CO_2-e ha^{-1} burnt
$EF_{P,PeatBurn,it}$	total increase in CO2-e emissions as a result of peat burning in stratum *i*, monitoring year *t*, tCO_2-e ha^{-1} burnt

Emissions factors for both biomass and peat burn were calculated separately so that total emissions between biomass and peat burn could be analyzed separately. Calculations of emissions factors can be found on the tab "AB Biomass Burn 2014_2017" column K and "PeatBurn" column J.Total emissions from burning were then calculated by summing up the products of the emissions factors by total hectares burned during the monitoring period. This calculation can be found in the monitoring calculation spreadsheet on Tab "Summary Monitoring Table", column C; rows 62-70, with the sum of emissions from fire in cell C71.

3.2.2.3 Emissions from Biomass Burn

Emissions from biomass burn have been estimated through the application of Equation 111 from the methodology.

$$EP_{P,BiomassBurn,it} = EF_{P,BiomassBurnCO2,it} + EF_{P,BiomassBurn,N2O,it} + EF_{P,BiomassBurn,CH4,it}$$ VM0004 – 111

where:

$EF_{P,BiomassBurn,it}$	total increase in CO_2-e emissions as a result of aboveground biomass burning in the project case in stratum *i*, monitoring year *t*; tCO_2-e ha^{-1} burnt
$EF_{P,BimassBurn,CO2,it}$	CO_2 emissions from biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
$EF_{P,BimassBurn,CO2,it}$	N_2O emissions from biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
$EF_{P,BimassBurn,CH4,it}$	CH_4 emissions from biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt

This calculation is performed in the monitoring calculation spreadsheet on Tab "ABBiomassBurn2014_2017", column L.

The t CO_2-e emissions resulting from fire are dependent on the proportion of carbon stocks burned and the combustion efficiency (CE). Average aboveground carbon stocks of the land cover stratum after fire were derived from post-fire above-ground carbon stock measurements taken during this monitoring period[4]. Field crews measured aboveground carbon stocks in 41 plots within areas that had been burned during the monitoring period. AGB for each plot was estimated using the Chave (2005) allometric equations for moist forest stands. It was found that there was a residual mean carbon stock of 120.0 tonnes d.m. ha^{-1} in burned peat swamp forest, 12.7 t d.m. ha^{-1} in burned peat shrubland, and 10 t d.m. ha^{-1} in burned areas of low/sparse vegetation. Decay adjustment factors in standing dead wood were taken from a 2008 study that summarized decay adjustment factors for tropical forest studies (Chao et al., 2008). The proportion of biomass burnt (PBB) was calculated by dividing the post-burn biomass by the pre-burn biomass estimates and subtracting the result from one

[4] As allowed by the VM0004 methodology, see section 19.2.2, Step 2a page 81.

for each stratum.

Default combustion efficiencies were selected from Table 2.6 of the IPCC AFOLU Guidelines and are reported in the parameter tables.

The CO_2e emission factor for biomass in stratum i was estimated as the t CO_2e of the measured mean aboveground carbon stock of the stratum in which fire was detected according to Equation 112 and 113.

VM0004 – 112

$$EF_{P,BiomassBurnCO2,it} = \left(MC_{BB,AG,it} \times PBB_{P,it} \times CE\right) \times \frac{44}{12}$$

where:

$E_{P,BimassBurn,CO2,it}$	CO_2 emissions form biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
$MC_{B,BB,AG,it}$	average aboveground biomass carbon stock in the baseline scenario for stratum *i*, time *t*; t CO_2-e
$PBB_{P,it}$	average proportion of $MC_{B,BB,AG,it}$ burnt under the project case for stratum *i* in time *t*; dimensionless
CE	average biomass combustion efficiency (IPCC default = 0.5); dimensionless
$44/12$	ration of molecular weights to CO_2 and carbon; dimensionless

$$PBB_{P,it} = 1 - \left(MC_{P,AG,it}^{burned} / MC_{BB,AG,it}\right) \times \frac{44}{12}$$ VM0004 – 113

where:

$PBB_{P,it}$	average proportion of $MC_{B,BB,AG,it}$ burnt under the project case for stratum *i* in time *t*; dimensionless
$MC_{P,AG,it}^{burned}$	estimated aboveground biomass carbon stock after burning under the project case for stratum *I*, time *t;* t CO_2-e ha^{-1} burnt
$MC_{B,BB,AG,it}$	average aboveground biomass carbon stock in the baseline scenario for stratum *i*, time *t*; t CO_2-e
$44/12$	ration of molecular weights to CO_2 and carbon; dimensionless

This calculation is performed in the monitoring calculation spreadsheet on Tab "ABBiomassBurn2014_2017", columns E - H.

Non –CO_2 emissions factors were calculated using Equation 115 and 116.

$$EF_{P,BiomasBurn,N20,it} = EF_{P,BiomassBurn,CO2,it} \times \frac{12}{44} \times \left({}^{N}/_{Cratio}\right) \times ER_{N20} \times {}^{44}/_{12} \times GWP_{N2O}$$ VM0004 - 115

$$EF_{P,BiomasBurn,CH4,it} = EF_{P,BiomassBurn,CO2,it} \times \frac{12}{44} \times ER_{CH4} \times {}^{16}/_{12} \times GWP_{CH4}$$ VM0004 - 116

where;

$E_{P,BimassBurn,CO2,it}$	CO_2 emissions form biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
$EF_{P,BimassBurn,CO2,it}$	N_2O emissions from biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
$EF_{P,BimassBurn,CH4,it}$	CH_4 emissions from biomass burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e ha^{-1} burnt
${}^{N}/_{Cratio}$	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_{CH4}	Global Warming Potential CH_4 (= 25 for the first commitment period); t CO_2-e (t CH_4)$^{-1}$
GWP_{N2O}	Global Warming Potential N_2O (= 298 for the first commitment period); t CO_2-e (t N_2O)$^{-1}$

This calculation is performed in the monitoring calculation spreadsheet on Tab "ABBiomassBurn2014_2017", columns I and J.

3.2.2.4 Emissions from Peat Burn

Emissions from peat burn are estimated through the application of Equations 117 – 120.

$$EF_{P,PeatBurn,it} = EF_{P,Peat\ Burn,CO2,it} + EF_{P,PeatBurnCH4,it}$$ VM0004 - 117

And:

$$EF_{P,Peat\ Burn,CO2,it} = \frac{M_{P,peat,it} \times EF_{CO2}}{10^6}$$ VM0004 - 118

$$EF_{P,Peat\ Burn,CH4,it} = \frac{M_{P,peat,it} \times EF_{CH4}}{10^6} \times GWP_{CH4}$$ VM0004 - 119

$$M_{P,it} = D_{P,Burn,it} \times 10{,}000 \times BD_i$$ VM0004 – 120

where:

$E_{P,PeatBurn,it}$	total increase in CO_2-e emissions as a result of peat burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e
$E_{P,PeatBurn,CO2,it}$	total CO_2 emissions from peat burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e
$EF_{P,PeatBurn,CH4,it}$	total CH_4 emissions from peat burning under the project case in stratum *I*, monitoring year *t;* t CO_2-e
$M_{P,peat,it}$	mass of peat burned under the project scenario in stratum I, time t; tons
EF_{CO2}	CO_2 emissions from the combustion of peat, g CO_2 / ton peat
EF_{CH4}	CH_4 emissions from the combustion of peat, g CH_4 / ton peat
GWP_{CH4}	Global Warming Potential CH_4 (= 25 for the first commitment period); t CO_2-e (t CH_4)$^{-1}$
$D_{P,burn,it}$	depth of peat burnt under the project scenario in stratum *i* at time *t*; meters
BD_i	bulk density of peat in stratum *I* (g cm^{-3} = tm^{-3})

This calculation is performed in the monitoring calculation spreadsheet on Tab "PeatBurn" column G,H,I,J and K.

An analysis of peat burn depth was conducted based on literature values for peat burn depths within areas that had experienced multiple fires. The Hoojier et al. 2014 study found a burn depth of 18 cm, 11 cm, and 4.3 cm for the first, second, and third fires respectively. A similar study conducted by Konecny et al. 2015 confirmed the burn depth values found in the Hooijer study. Additionally, a field study of burn depths conducted within the CAA (see Tally Sheet Burn Impact) found burn depths ranging from .5-3cm, which help to support the conservativeness of the literature values applied.

The burn depths in both the Hooijer and Konecny studies were determined by analyzing fires that occurred within a study area over a period of roughly 20 years. As the peat shrubland strata is

defined as peat swamp forest that has been burned and is in a successionary stage, this strata has a strong relationship to fire. However, many of these shrubland areas that have a history of experiencing wildfires in the CAA were burned prior to the project start date. In order to best account for the fire history as related to burn depth within the carbon accounting area, MODIS burn area data was analyzed for a period of 9 years prior to the project start date in 2009 in order to determine which areas of the accounting area had experienced multiple burns prior to the project start date. The period of 2000-2009 was determined to be a conservative temporal window to review fire frequency, based on the temporal window used in the Hoojier and Konecy papers, which was conducted over a period of 20 years.

Additionally, only MODIS burn area data was used to estimate the number of historical burns within the CAA, as hotspot data provided less reliable area estimates. Many of the shrubland areas within the CAA were shown to have experienced fires through hotspot data, but this wasn't always captured in the MODIS burn area data. The project chose to only analyze MODIS burn area data to conservatively estimate the burn frequency within the CAA prior to the project start. The historical MODIS data and burn areas during the project lifetime prior to this monitoring period were combined in order to determine the historical burn frequency within the 2014-2017 burn area. The historical burn frequency determined the peat burn depth applied across the 2014-2017 monitored burn area.

Emissions factors for CO_2 and CH_4 were estimated using the baseline methodology default figures. The emissions factors for peat combustion at the lowest temperature were applied to result in higher (conservative) project emissions.[5]

3.2.2.5 GHG Emissions due to land clearing ($E_{P,it}^{LCC}$)

LandSAT and PlanetScoper imagery were used to detect deforestation not due to fire or logging within the Carbon Accounting Area. This is the forest area that transitioned during this monitoring period but didn't overlap with logging gaps or the burn area.
The GHG emissions attributable to deforestation are estimated according to Equation 121.

$$E_{P,it}^{LLC} = \sum_{t=1}^{t*} \sum_{i=1}^{Mps} \left(A_{P,LCC,it} \times EF_{P,LCC,AG,it}\right) + \left(A_{peatimpact,it}^{LCC} \times EF_{peatdrainage,it}\right)$$ VM0004 - 121

where;

$E_{P,it}^{LLC}$	GHG emissions due to land cover change in the project area; tCO_2-e
$A_{P,LCC,it}$	GHG emissions due to land cover change in the project area; t CO_2-e
$A_{peatimpact,it}^{LLC}$	area of drainage impact due to land cover change in stratum *i*, monitoring year *t*; ha
$EF_{P,LCC,AG,it}$	average deforestation emission factor for stratum *i*, monitoring year *t*; t CO_2-e ha^{-1}
$EF_{Peat\ drainage,it}$	average peat drainage emission factor for stratum *i*, monitoring year *t*; t CO_2-e ha^{-1}

All calculations are performed in the calculation spreadsheet on the tab titled "Deforestation2014_2017"

[5] There is a mistake in the methodology that states "applying the emission factors at the higher temperature thresholds leads to higher emissions". This is the opposite of what is true. Emissions factors for the lower temperatures leads to higher emissions. Subsequently the lower temperature emission factors were conservatively applied in the Project scenario.

Step 1: Monitor area deforested and area of impact of peat drainage

Within the Carbon Accounting Area and a 3km buffer zone surrounding the project area, deforestation was spatially delineated using Landsat imagery and tracked using an accuracy assessment of 80% or more.

In accordance with the methodology it was conservatively assumed that the area affected by land cover change (not related to fire or logging) was equal to 100% of the converted area ($A_{P,LLC,it}$).

Fire was the cause of 6,124.6 hectares of deforestation in the project area. Emissions from deforestation from fire are accounted for in Section 6.2.2. A total of 853 hectares of non-fire related deforestation was detected during the monitoring period.

This deforestation activity is predominately being driven by the local communities in the southern end of the Project area.

Deforestation activities did not result in any peat drainage sincethere was no conversion to plantation and the associated peat drainage activities did not occur. Therefore emissions from the deforestation activities in peat swamp forest only impacted aboveground biomass.

3.2.2.5.1 Emissions from Biomass as a result of deforestation

The total emissions resulting from deforestation are calculated as the difference between the aboveground biomass of the land cover class prior to deforestation and the land cover class following deforestation.

This calculation is performed in the monitoring calculation spreadsheet on Tab “Deforestation 2014_2017”, column R.

3.2.2.6 Treatment of Uncertainty Ex-Post

Total uncertainty is calculated using equation 130 of VM0004 where the uncertainty in baseline scenario $Uncertainty_{BSL,t} = 11.025\%$ as previously verified, remaining unchanged. We take $t = 1$ for the reporting period (see project description deviation in Section 2.2.4). Total uncertainty per equation 130 is estimated as 9.5% which is below the required 10% threshold, therefore no uncertainty deduction is applied per equation 131 of VM0004 (see the accounting model, Rimba Raya_2014_2017).

Uncertainty for the ex-post, with-project scenario was estimated for the current reporting period as the weighted geometric average of $U_{P,SS,i}$ over strata $i = 1, \dots, m_{PS}$ where $U_{P,SS,i}$ is the percentage uncertainty expressed as a margin of error at the 90% confidence level relative to emissions for stratum i at time t as defined in equations 127 and 128 of VM0004.

As illustrated in the conceptual diagram of monitoring equations, Figure 4 in section 19.3 of VM0004, and Figure 3 in section 10.2.2, equations 91, 109, 121, and 66 are the equations that comprise the calculation of leakage and project emissions. These equations give us the final emissions estimates for $E_{P,SS,it}$, as defined by equation 127 (shown below). We quantify $U_{P,SS,i}$ for all variables specified in Figure 4 of the VM0004 methodology, and multiply that uncertainty against the associated emissions source, $E_{P,SS,it}$, that is associated with each variable. Hence the combined uncertainty is calculated as

$$Uncertainty_{P,it} = \frac{\sqrt{\left(U_{P,SS1,i} * E_{P,SS1,it}\right)^2 + \left(U_{P,SS2,i} * E_{P,SS2,it}\right)^2 \dots + \dots \left(U_{P,SSn,i} * E_{P,SSn,it}\right)^2}}{E_{P,SS1,it} + E_{P,SS2,it} \dots + \dots E_{P,SSn,it}}$$

where $U_{P,SS1,i}$ is the uncertainty for each variable specified in the VM0004 methodology with associated uncertainty in the project boundary and associated with emissions due to logging, fire and land clearing (deforestation), market effects leakage and activity displacement leakage.

Several assumptions of uncertainty were made for several variables as follows:

We assume that the uncertainty of $N_{P,i}^{gaps} = 0$ as the number of logging gaps is known and uncertainty of $A_{peatimpact,i}^{logging} = 0$ as the area of logging impact was directly measured in the field and not from imagery. The variable CE is an IPCC default value, and is a constant with no associated uncertainty. The uncertainty for both market effects leakage and activity displacement leakage was found to be zero. No emissions from market effects leakage were accounted for during this monitoring period, therefore the uncertainty for this estimate is 0. Additionally, the area of activity displacement leakage was zero for this monitoring period, as the methodology does not require the monitoring of activity displacement leakage after the first 5 years of the project lifetime. Likewise, for market effects leakage, the variable $C_{B,XBT,it}$, which is the carbon emissions due to displaced timber harvests in the baseline scenario in stratum i, time t, is zero for this monitoring period.

3.2.3 Leakage

Expansion of PT BEST concessions were not monitored during this monitoring period, as the methodology required 5 years of monitoring from the project start date.

1. **Existing PT. BEST concessions were monitored for development and/or expansion for the first five years of the project. It is not required by the methodology to monitor these areas starting from this monitoring period onward.**
   PT BEST concessions were monitored for the first 5 years from which baseline deforestation

was expected to occur, as shown below.

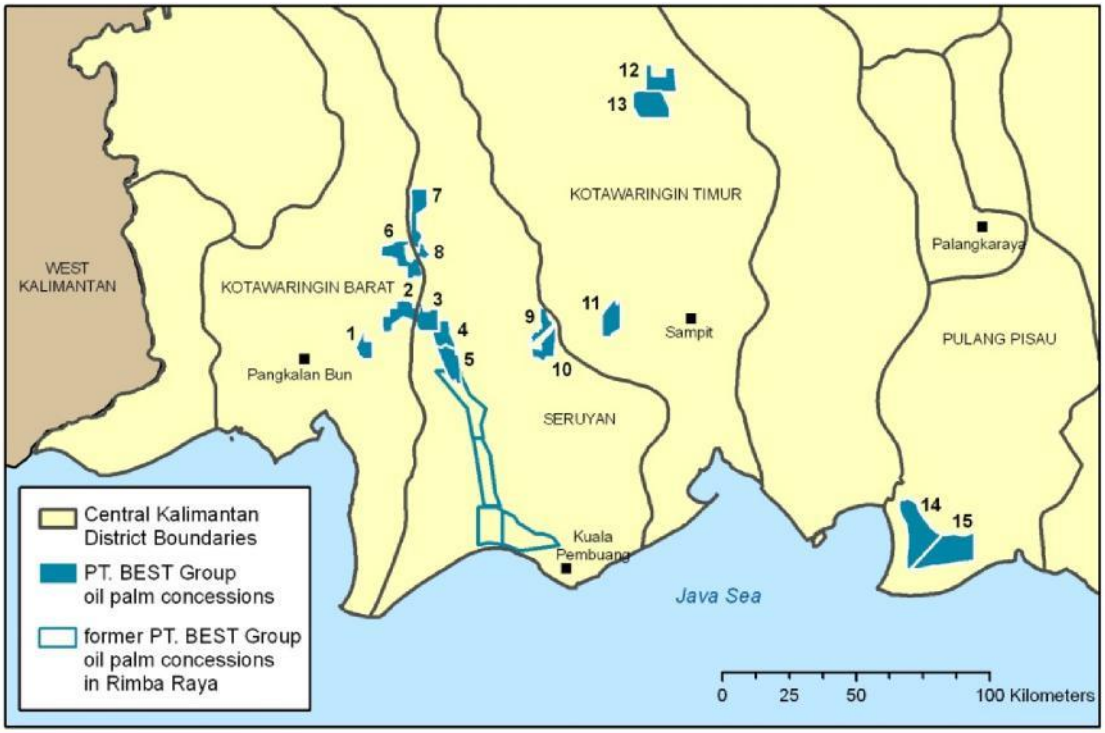

Figure 7: Map of PT BEST Oil Palm Concessions

2. Any new PT BEST concessions issued in Indonesia were monitored during previous monitoring periods.

In accordance with the VM0004 Methodology and the monitoring plan, "Leakage monitoring is conducted for five years beyond the date at which deforestation was projected to occur in the baseline (July 2009-July 2014)". Since this monitoring period is from July 2014-June 2017, leakage is no longer required to be monitored per the methodology. This means that the only leakage emissions accounted for are due to peat drainage in leakage areas that had already been classified as deforested in previous monitoring periods.

Continued emissions from peat drainage were calculated using the equation below:

$$\Delta C_{it_continued} = ME_{B,dd,it}$$

(VM004 – 82)

Where:

$\Delta C_{it_continued}$ = average greenhouse gas emissions resulting from continued peat drainage or soil emissions in stratum i; t CO_2-e ha^{-1}.

$ME_{B,dd,it}$ = mean CO_2 emissions from drained peat in stratum i, time t; t CO_2 ha^{-1}

$ME_{B,dd,it}$ was calculated by multiplying average emissions for 1 cm of drainage depth, which was a literature value validated at 1.33 tCO2 ha^{-1} y^{-1}, by the measured peat drainage depth of

55 cm. The result was a value of 73.15 t CO_2 ha^{-1} y^{-1}. Since conversion of peat swamp forest to plantation was found to occur on a total of 1,279 ha in the 5 year period of monitoring leakage, annual leakage was calculated as shown below:

73.15 t CO_2 ha^{-1} y^{-1} * 1,279 ha = 93,537 t CO_2e y^{-1}

3.2.4 Net GHG Emission Reductions and Removals

The calculation of project emissions over the monitoring period is performed on the tab "Summary Emissions Table" of the spreadsheet. The net emissions over the monitoring period are summarized in tab titled 'Summary Project Emissions Table'.

1.1.1.1 Logging ($E_{P,it}^{logging}$)

Emissions related to illegal timber extraction and drainage from (illegal) timber extraction were estimated to be **140,143 tCO_2-e.**

1.1.1.2 Fire ($E_{P,it}^{fire}$)

Emissions related to fire were estimated to be **1,483,887 tCO_2-e.**

1.1.1.3 Land Use / Land Cover (LU/LC) changes ($E_{P,it}^{LUC}$)

Emissions related to deforestation were estimated to be **320,377 tCO_2-e.**

1.1.1.4 Activity Shifting Leakage

Emissions from activity shifting leakage were estimated to be **278,304 tCO_2-e.**

1.1.1.5 Summary of Carbon Accounting for Monitoring Report 4 (M4)

Actual net greenhouse gas emissions avoided up to and including the fourth (current) monitoring period (M4) are presented in the table below (Table 13). The calculations performed to generate the summary tables can be found in the calculation spreadsheet for this monitoring period on the tab titled "SummaryProjectEmissionsTable", rows 10 - 12, within the calculation spreadsheet.

The buffer allocation was calculated using the VCS AFOLU Non-Permanence Risk Tool V3.3. The project was calculated to have a risk rating of 10%, the lowest risk rating allowable under the VCS Non-Permanence Risk assessment. The project will seek to be issued a buffer release as part of this verification. The calculation of the buffer allocation is conducted on tab titled "SummaryProjectEmissionsTable", column T, within the calculation spreadsheet.

The total net VCUs generated during the Monitoring period covered by this report (i.e. 1 July 2014 – 22 June 2017) are calculated to be:

11,121,623 t CO_2-e (cell C38)

The NERs are:

11,163,715 t CO_2-e,

The Risk Buffer allocation is:

1,144,201 t CO_2-e,

The Risk Buffer Release is:

1,102,111 t CO_2-e

The VCUs are presented by year in Table 14 to facilitate reporting of emissions by calendar year as required by the Projects registry and Table 15 shows VCU generation by vintage year.

Year	Net VCU allocation (tCO2e)	Buffer Allocation (tCO2e)	Buffer Release (tCO2e)
2009 – 2010 (July – June)	2,181,352	242,372	36,355
2010 - 2011 (July-June)	2,453,742	433,013	187,639
2011 - 2012 (July-June)	2,788,156	492,028	213,211
2012 - 2013 (July-June)	3,347,516	601,138	260,493
2013 - 2014 (July-June)	4,393,291	672,486	232,783
2014 - 2015 (July-June)	3,885,255	442,088	66,313
2015 - 2016 (Jul – June)	3,172,906	362,938	54,441
2016 - 2017 (July-June)	4,063,462	339,175	50,876
Total			**1,102,111**

Table 13: Voluntary Carbon Unit (VCU) Vintages (grey shaded years represent previously issued VCs; white years represent current monitoring period)

Year	Baseline emissions or removals (tCO_2e)	Project emissions or removals (tCO_2e)	Leakage emissions (tCO_2e)	Net GHG emission reductions or removals (tCO_2e)
2009 – 2010 (July – June)	2,462,212	(38,488)	0	2,423,724
2010 - 2011 (July-June)	3,654,181	(767,425)	0	2,886,756
2011 - 2012 (July-June)	3,592,610	(312,427)	0	3,280,184
2012 - 2013 (July-June)	4,124,970	(117,382)	(58,934)	3,948,654
2013 - 2014 (July-June)	5,362,569	(189,603)	(93,537)	5,079,431
2014 - 2015 (July-June)	5,069,617	(648,737)	(93,537)	4,327,344
2015 - 2016 (Jul – June)	4,279,896	(650,514)	(93,537)	3,535,845
2016 - 2017 (July-June)	4,036,912	(645,155)	(91,230)	3,300,526
Total	**32,582,968**	**(3,369,731)**	**(430,775)**	**28,782,463**

Table 14: Total GHG Emissions Reductions generated over the project lifetime.

The generated VCUs during this monitoring period include the authorized buffer release that was distributed in each year of this reporting period. This distribution of he buffer release credits shown in table 13 can be found in table 15 below based on the vintage year of their release. This table also includes the final calculations for the 11,121,623 VCUs generated during this monitoring period, which were rounded according to v3.6 of the VCS AFOLU Requirements.

Year	Net GHG Emission Reductions or Removals (tCO2e)	Annual Buffer Allocation (t CO2e)	Buffer Release (tCO2e)	Net GHG Emissions Credits (tCO2e)
2014	2,181,455.61	(222,860.80)	138,896.31	2,097,490.61
2015	3,913,810.89	(400,696.20)	412,159.19	3,925,272.89
2016	3,431,749.31	(352,450.37)	414,423.81	3,493,722.24
2017	1,636,699.19	(168,193.63)	136,631.69	1,605,137.26
Total	**11,163,715.00**	**(1,144,201.00)**	**1,102,111.00**	**11,121,623.00**

Table 15: Net GHG Emission Credits for Monitoring Period with Vintage Buffer Release

3.3 Optional Criterion: Climate Change Adaptation Benefits

The project is pursuing Gold Level certification for Climate Change Adaptation Benefits under the CCB standard on the basis of providing significant support to communities and biodiversity in adapting to the impacts of climate change. The following sections demonstrate how the project successfully fulfils the requirements for demonstrating climate level gold certification.

Anticipated Local Climate Change Scenario

Tropical peat land ecosystems, in addition to storing and sequestering carbon (Neuzil 1995) and harboring unique biodiversity (Whitmore 1984), provide economically valuable timber and non-timber resources to communities (Parish 2002). Peatlands also serve as water catchments, flood control systems and act as a coastal buffer between salt and fresh water hydrologic systems (Rieley et al. 1997, Page et al. 1999). These ecosystem services are essential to communities whose livelihoods are tightly linked to their environment. Likewise, disruption to the peatland ecosystem, through climate change, is likely to negatively impact resource-dependent communities, both human and non-human, in a number of ways.

The Rimba Raya peatland ecosystem is adapted to seasonal flooding and drying on an annual

basis. Ombrogenous (rain fed) peat swamp forests are seasonally inundated during the wet season, which may vary annually by several months, typically November-June. Water levels drop significantly during the dry season, July-October, and some areas of peat swamp forest may dry completely. More infrequent and prolonged droughts naturally occur in association with El Nino Southern Oscillation (ENSO) events across Borneo historically every 6-7 years (Sakai 2006). Drought conditions cause lowland forest dipterocarp trees and a suite of co-evolved plant families to synchronously flower and fruit, producing an abundant food supply to vertebrate populations during "mast" years.

Annual and periodic droughts underlie the spatial and temporal distribution and ecology of forest plant and animal species, and are a natural ecosystem process which structures biodiversity and forest-based community resources. In human-influenced ecosystems, such as Rimba Raya, droughts can also promote the uncontrolled spread of fire. The interaction between drought and fire has led to extensive and devastating loss of forest in the region, especially during ENSO events on the islands of Borneo and Sumatra (Goldammer and Mutch 2001; Tacconi 2003). During 1997-98, a strong El Nino associated with extremely dry conditions, caused fires to burn more than 5 million hectares of forest in the province of East Kalimantan alone (Page et al 2002).

Fragmented and degraded forests are more susceptible to fire than intact forests since they are drier due to increased evapotranspiration and carry higher fuel loads (Cochrane et al. 1999; Laurance 2003), especially since these areas often lie in close proximity to active and incidental fires associated with human activity. Degraded peatlands are especially prone to extensive and severe fires where exposed peat and low water tables create conditions conducive to long-burning below-ground fires. Therefore, peatland forests already impacted by human activities, such as those in Rimba Raya, are at moderately high risk for deforestation.

The frequency and severity of ENSO-driven drought has increased substantially in the past three decades (Harrison 2001) and climate models suggest this may be the result of climate change (e.g. Timmermann et al. 1999). Kalimantan experienced major landscape-altering fires in 1982-83, 1997-98 and 2006. In Rimba Raya, drought and fire have been, and are expected to be, the primary drivers of climate change-related impacts on community and biodiversity into the future.

Predicted Climate Change Impacts on Communities and Biodiversity along with Mitigation Techniques

Four areas of risk due to climate change were identified along with brief descriptions of project activities that mitigate them and provide further benefits. These are:

- ***Food security*:** In the absence of project activities, drought and fire would be expected to reduce food security. Agricultural productivity would be expected to decline as a direct result of drought-induced water shortage and soil nutrient loss from fire, as well as crop loss due to flooding. At lower latitudes, especially seasonally dry and tropical regions, crop productivity is projected to decrease for even small local temperature increases (1-2°C), which would increase risk of hunger. Regional changes in the distribution and production of particular fish species are expected due to continued warming, with adverse effects projected for aquaculture and fisheries. Project activities which mitigate this risk

include:

- Fire suppression, education and training
- Reforestation/Agro-Forestry-Afforestation
- Soil enrichment with Biochar
- Crop diversification, harvest rotation and application of new technologies for improved production
- Protect and manage large patches of contiguous forest

- ***Income***: Communities in the project management zone historically have had limited means of earning cash income with primary dependence on fishing, farming and collecting timber and non-timber resources from local forests. This natural resource based economy is especially vulnerable to climate change including the cascading effects from drought and fire that lead to reduced agricultural and fish harvests. The most vulnerable industries, settlements and societies are generally those in coastal and river flood plains, those whose economies are closely linked with climate-sensitive resources, and those in areas prone to extreme weather events. Additionally, fire-driven forest loss and damage directly reduce forest-sourced products, further reducing cash income. Project activities which mitigate this risk include:

  - Fire suppression, education and training
  - Reforestation/Agro-Forestry-Afforestation
  - Crop diversification, harvest rotation and application of new technologies for improved production
  - Aquaponics
  - Soil enrichment with Biochar
  - Protect and manage large patches of contiguous forest

- ***Health***: Climate change and associated drought and fire would be expected to have a negative impact on water quality and health in the absence of the project. Peatlands act as water catchment and buffering systems providing water storage and protecting against flooding. Ecosystem damage would negatively impact this ecosystem function. Communities are dependent on the Seruyan River for all their water needs and project activities include improving access to clean drinking water, which is not readily available in Seruyan villages. Drought and flooding, predicted with climate change would be expected to constrain clean water access and increase the prevalence of water-borne disease in the absence of the project.

  Increased water temperatures associated with climate change would also be expected to

increase the prevalence and toxicity of cholera outbreaks; increases malnutrition and consequent disorders, with implications for child growth and development; increase deaths, disease and injury due to heat waves, floods, storms, fires and droughts; increase the burden of diarrheal disease; increase the frequency of cardio-respiratory diseases due to higher concentrations of ground level ozone related to climate change; and alter the spatial distribution of some infectious disease vectors. These issues are expected to affect the health of millions of people, especially those with low adaptive capacity. Project activities which mitigate this risk include:

- Water conservation, improved irrigation techniques
- Community education and build clinics to provide better access to healthcare

- ***Biodiversity:*** Climate change, drought and fire would be expected to have independent and compounding negative impacts on biodiversity in the absence of the project. Fire and drought will impact tree mortality, contributing to species extirpation and habitat fragmentation, as well as changing in pattern of fruiting. Shift in fruiting patters may disrupt or change synchronous fruiting unique to Bornean ecosystems with negative consequences on the project areas biodiversity.

  Climate change has already caused numerous shifts in species distributions and abundance over the last three decades (Thomas et al. 2004), which can cause population fragmentation and decline leading to species extinction. As much as 50% of Asia's biodiversity is at risk of extinction due to climate change (Cruz et al. 2007). In Borneo, climate change driven fires are expected to directly impact species populations and biodiversity (CIFOR 2006). Forest fire is the primary driver of deforestation, which has accelerated in the last decade and is projected to cause the near-complete deforestation in Rimba Raya by 2020 in the absence of the project activities aimed at protecting and connecting large habitat patches. Such forest loss would cause severe declines in biodiversity and further threaten at-risk populations of globally endangered species including a number of primates.

  The orangutan, whose distribution declined by 91% this century (UNEP 2007), continues to suffer population losses due in part to climate change induced fire, habitat loss and fragmentation (Wich et al. 2008). Shifts in the timing and extent of dry seasons and fruit abundance are also likely to affect orangutan and other populations by reducing food availability and interrupting breeding and birth cycles. Fire and drought that reduce abundance of fruits will negatively impact orangutan populations because females are more likely to conceive during periods when food resources are not limited (WWF 2002). Project activities which mitigate this risk include:

  - Fire suppression, education and training
  - Reforestation/Agro-Forestry-Afforestation
  - Protect and manage large patches of contiguous forest

Community and Biodiversity Vulnerability to Climate Change

Communities and biodiversity in the Rimba Raya project zone are especially vulnerable to the negative impacts of local climate change.

Communities remain dependent on a resource-based economy centered on subsistence farming, fishing and resource extraction from nearby forests; therefore any loss or change to these resources has an immediate and direct effect on communities. Loss of farmland, loss of forest, declining water quality and soil loss, lack of diversity in livelihood resources, and lack of capacity for developing new livelihood strategies have created poor communities with little resilience to climate change in the absence of the project.

Biodiversity is similarly at risk from local climate change, which has already caused more frequent severe droughts leading to more destructive fires causing forest loss and degradation, with major landscape-altering fires occurring in Kalimantan in 1982-83, 1997-98 and 2006. Such fires have been shown to dramatically reduce structural and biological complexity (Schindele et al. 1989), reduce tree biodiversity (Slik 2004) and cause population declines and local extinction of forest-dependent animal species (Peres et al 2003) because of severe declines in food resources (Frederikkson et al. 2006).

Maintaining biodiversity in the project is dependent on stabilizing and improving habitat for small populations at risk of extinction. The interaction of expected climate change effects (drought) and human activities (fire) would be expected to lead to complete deforestation with a dramatic loss of biodiversity in the absence of project activities aimed at protecting and restoring habitats and managing human resource use and activity.

Analyzing Climate Change Impacts

In order to demonstrate the interrelated effects of climate change on community and biodiversity, path analysis diagrams are used to identify impacts and illustrate the ways in which drought and fire affect community (food security, health, income) and biodiversity. These diagrams also aid in the assessment of how impacts are minimized and mitigated and provide a context for adaptation to climate change.

Food Security

In the absence of project activities, drought and fire would be expected to reduce food security through multiple pathways. Agricultural productivity would be expected to decline as a direct result of drought-induced water shortage and soil nutrient loss from fire. Agricultural crop loss due to flooding would also be expected to become more prevalent in the absence of the project. Peatlands act as flood control systems where forest and peat remains intact. Fire damage to forests and peat negatively impact these flood control services. Erosion and siltation of rivers would be expected to accompany fire damage to forests. This, coupled with direct loss of fisheries due to fire, would be expected to reduce fish catches. Given the current dependence on farming and fishing, climate change related impacts would have a significant negative impact on

the food security of communities.

Income

Communities in the project management zone historically have had limited means of earning cash income with primary dependence on fishing, farming and collecting timber and non-timber resources from local forests This natural resource based economy is especially vulnerable to climate change including the cascading effects from drought and fire that lead to reduced agricultural and fish harvests. Additionally, fire-driven forest loss and damage directly reduce forest-sourced products, further reducing cash income.

Health

Climate change and associated drought and fire would be expected to have a negative impact on water quality and health in the absence of the project. Peatlands act as water catchment and buffering systems providing water storage and protecting against flooding. Ecosystem damage would negatively impact this ecosystem function. Communities are dependent on the Seruyan River for all their water needs and project activities include improving access to clean drinking water, which is not readily available in Seruyan villages. Drought and flooding, predicted with climate change would be expected to constrain clean water access and increase the prevalence of water-borne disease in the absence of the project. Increased water temperatures associated with climate change would also be expected to increase the prevalence and toxicity of cholera outbreaks.

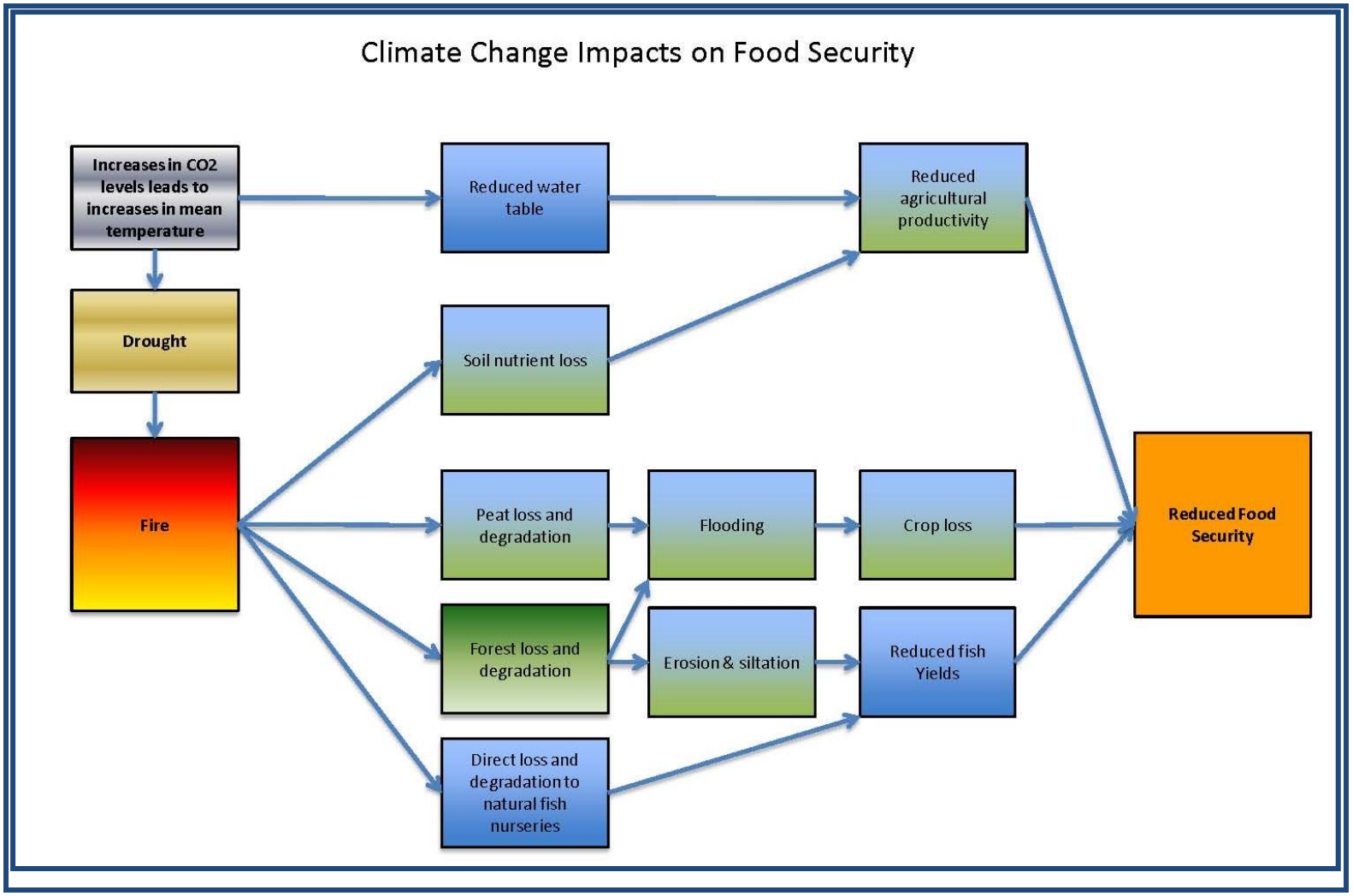

Figure 8: Climate Change Impacts on Food Security

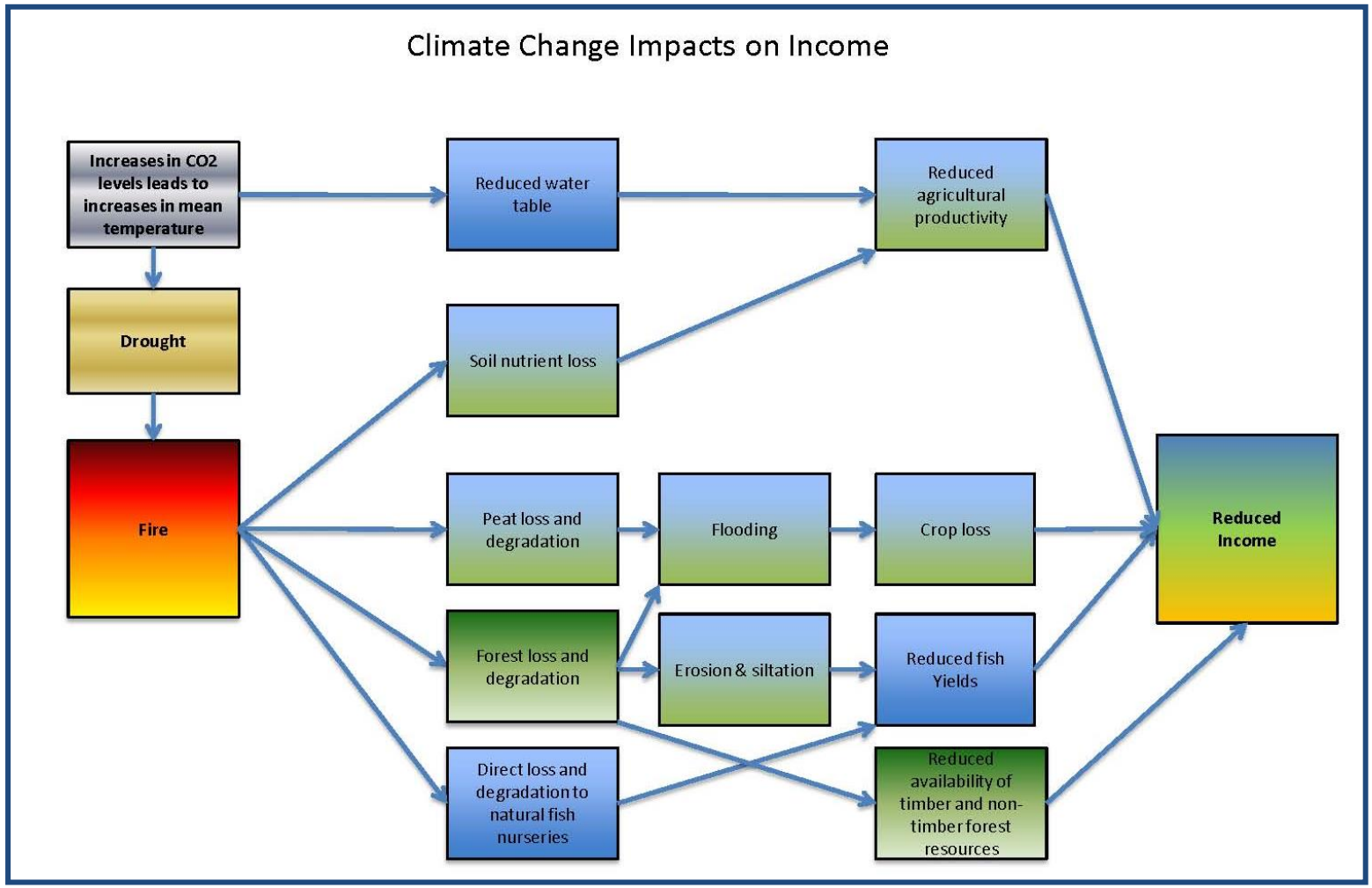

Figure 9: Climate Change Impacts on Income

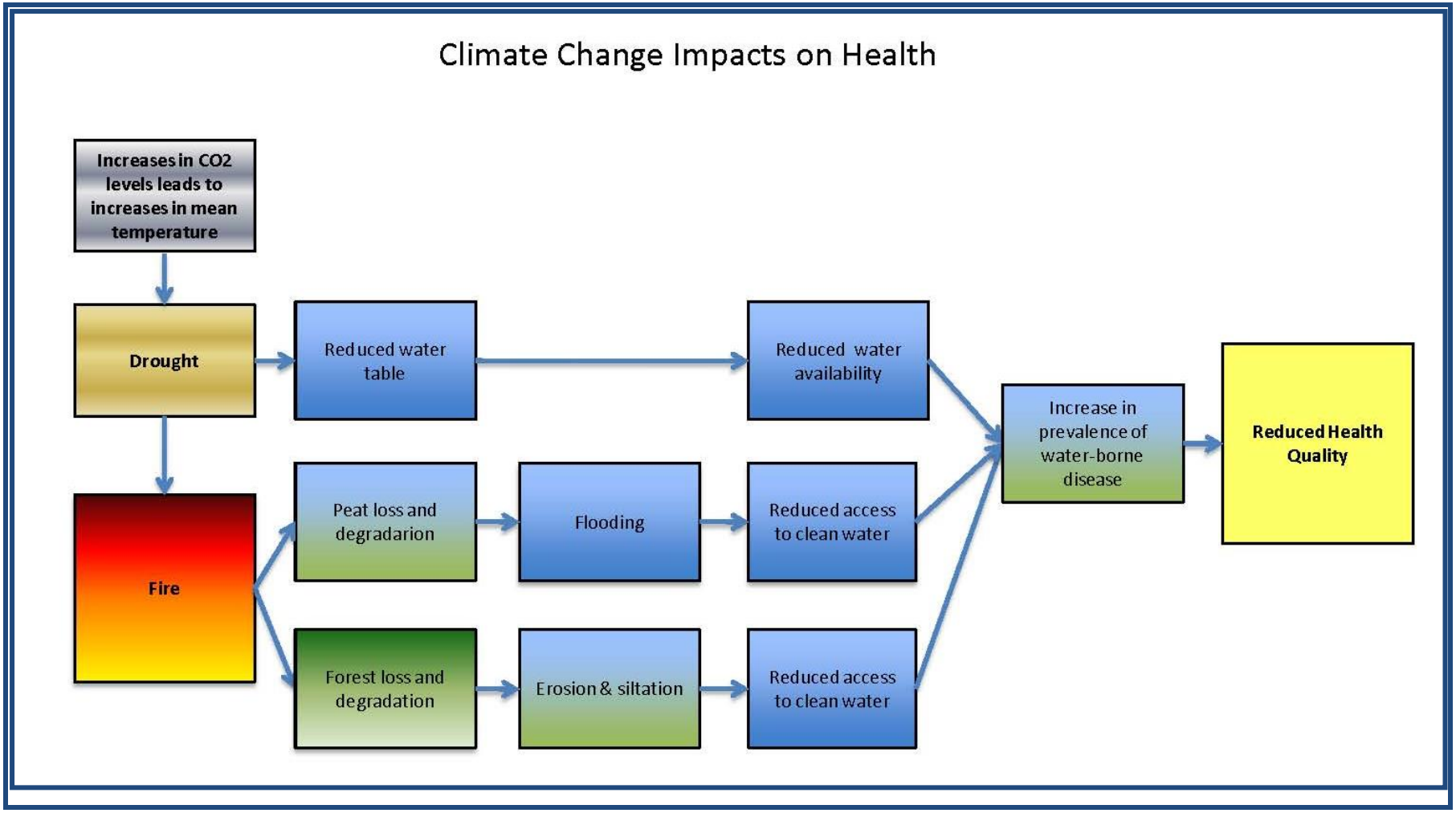

Figure 10: Climate Change Impacts on Health

Biodiversity

Climate change, drought and fire would be expected to have independent and compounding negative impacts on biodiversity in the absence of the project. Fire can have a devastating impact on biodiversity, causing high rates of tree mortality contributing to species extirpation and habitat fragmentation that reduces habitat quality and value for many forest-requiring species. Drought can also have a direct impact on forests through tree mortality, which is expected to increase with increased frequency of drought (Nishimua et al. 2006). Warmer temperatures and drought, especially severe droughts associated with ENSO events may cause changes in the patterns of fruiting. The ENSO cycle currently repeats roughly 2–3 times per decade, a pattern has potentially changed relatively recently (Cannon et al 2007), and is likely to shift due to climate change (Trenberth & Hoar 1997). Such shifts may disrupt or change synchronous fruiting unique to Bornean ecosystems with cascading effects on plant and animal species (Cannon et al. 2007) and negative consequence for biodiversity.

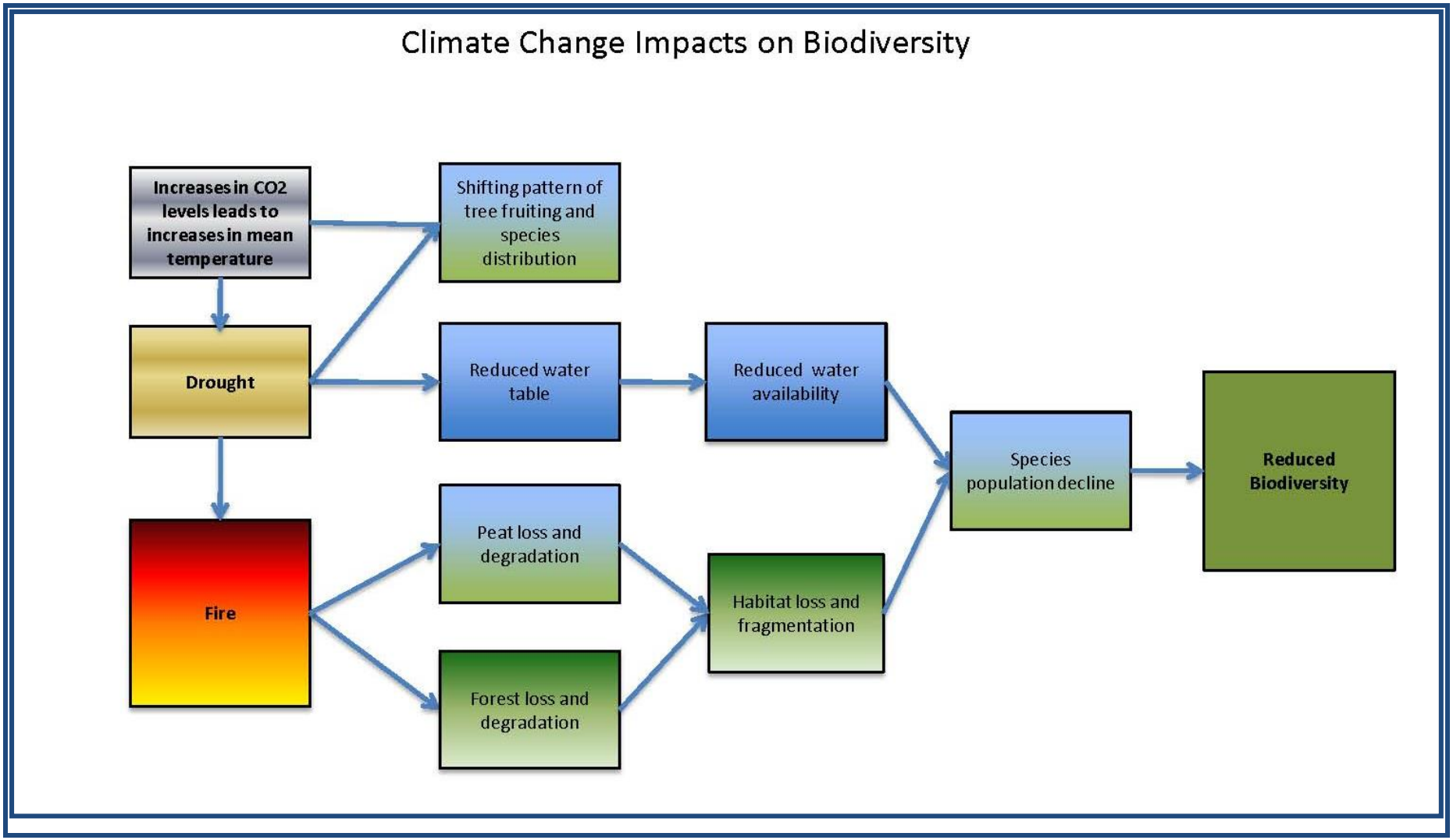

Figure 11: Climate Change Impacts on Biodiversity

3.2.5 Activities and/or Processes Implemented for Adaptation (GL1.4)

Many climate change impacts can be avoided, reduced or delayed by mitigation. Project activities have been designed to address the negative impacts associated with drought and fire - the primary drivers of environmental degradation associated with climate change. This has also made project benefits more resilient to local climate change since programs were already in place to address these impacts e.g. soil enrichment being used to improve crop production and also sustain this benefit even with expected climate change impacts. Given the adaptive management framework of the project, the location, frequency, level and duration of interventions such as soil enrichment will be adjusted as needed to achieve project benefits in an expectedly variable and changing environment.

Furthermore, the climate project benefits have been and will continue to be protected, monitored, quantified and closely tracked in order to meet the requirements of avoided emissions under the Voluntary Carbon Standard (VCS). Since the primary objectives are to protect peat and forests, these activities have, and are expected to continue to stabilize and mediate predicted climate change impacts.

While it should be cautioned that climate change can slow the pace of sustainable development, implementation of well-designed development activities can also reduce the vulnerability to climate change by enhancing adaptive capacity and increasing resilience. Some impacts can be mitigated, but for unavoidable impacts, adaptation is the only available and appropriate response (Case et al. 2008). Adaptation is necessary to address climate change impacts that are already in process (IPCC 2007), especially those addressing near-term impacts (Case et al. 2008). Activities to assist communities and biodiversity adapt to climate change are summarized below.

Case et al. 2008 suggest there is value in adopting a portfolio or mix of strategies that includes mitigation, adaptation, technological development and capacity building (to enhance both adaptation and mitigation) and research (on climate science, impacts, adaptation and mitigation). The Rimba Raya project employs such a range of strategies and is working to combine policies, incentive-based approaches, and actions across stakeholders including community members, regional and national government and agencies and NGOs.

By targeting climate change impacts in project development the Rimba Raya project has increased adaptive capacity of biodiversity (biological systems) and community. Project proponents also recognize that impacts of climate change vary spatially and temporally within the region and project, and are committed to meeting the expected increasing costs of implementing programs and activities to mitigate impacts of climate change to project benefits.

The tables below (Tables 16, 17, 18, 19, and 20) summarize activities that used to minimize, mitigate and/or assist communities and biodiversity adapt to climate change impacts that could affect project benefits.

Climate Change Associated Risk	Impact Addressed	Activity	Minimize Impact	Mitigate Impact
Fire	Peat loss and damage, forest loss and damage	Fire suppression, education and training	**X**	
Drought & Fire	Peat drying and oxidation	Peat re-wetting (see Couwenberg 2009)	**X**	
Fire	Forest loss and damage	Reforestation/Agro-Forestry-Afforestation		**X**

Table 16. Climate Project Benefit: Reduced GHG Emissions

Climate Change Associated Risk	Impact Addressed	Activity	Minimize Impact	Mitigate Impact	Adapt to Impact
Fire	Peat loss and damage, forest loss and damage	Fire suppression, education and training	**X**		
Drought	Reduced water table	Water conservation, improved irrigation techniques		**X**	
Fire	Soil nutrient loss due to fire	Soil enrichment with Biochar		**X**	
Fire and forest loss and damage	Erosion, siltation	Reforestation & Agro-Forestry		**X**	
Multiple Climate-driven environmental changes	Reduced agricultural productivity and crop loss	Crop diversification, harvest rotation and application of new technologies for improved production			**X**
Multiple Climate-driven environmental changes	Reduced fish yields	Aquaponics			**X**

Table 17. Community Project Benefit: Improved Food Security

Climate Change Associated Risk	Impact Addressed	Activity	Minimize Impact	Mitigate Impact	Adapt to Impact
Multiple Climate-driven	Same impacts to forest, agriculture	Same activities as those described in Food	**X**	**X**	

environmental changes	and fishing described in Food Security Project Benefits	Security Project Benefits			
Fire	Reduced income from forest products,	New agroforestry development and application of technology for sustainable yields			**X**
Multiple Climate-driven environmental changes	Reduced income from agriculture and fishing	Capacity building for income diversification			**X**

Table 18. Community Project Benefit: Increased Income

Climate Change Associated Risk	Impact Addressed	Activity	Minimize Impact	Mitigate Impact	Adapt to Impact
Fire	Peat loss and damage, forest loss and damage which leads to flooding	Fire suppression, education and training	**X**		
	Forest loss and damage and flooding	Reforestation & Agro-Forestry		**X**	
Drought	Reduced water table	Water conservation, improved irrigation techniques		**X**	
Multiple Climate-driven environmental changes	Increased Disease	Community education and build clinics to provide better access to healthcare			**X**

Table 19. Community Project Benefit: Improved Health

Climate Change Associated Risk	Impact Addressed	Activity	Minimize Impact	Mitigate Impact	Adapt to Impact
Fire	Forest loss and damage which leads to habitat loss and fragmentation	Fire suppression, education and training	**X**		
	Forest loss and damage which leads to habitat loss and fragmentation	Protect and manage large patches of contiguous forest			**X**
Multiple Climate-driven environmental changes	Change in pattern of forest fruiting (impacting vertebrate fauna)	Protect and manage large patches of contiguous forest			**X**

Table 20. Biodiversity Project Benefit: Longterm Maintenance of Biodiversity

Table 21 summarizes progress made during this monitoring period by carrying out project activities aimed at minimizing, mitigating and /or assisting communities and biodiversity adaptations to climate change impacts. It shows which activities have been implemented already and shows planned activities for the next verification period.

Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
Fire suppression, education and training	Started	Training with BKSDA began in 2010 and will be on-going. With the hiring of field crews completed in this monitoring period, the main internal training will be conducted in Q2 2015.	May-10	On-going		RRC Project Manager
Reforestation/Agro-Forestry-Afforestation	Started	Communities on the northern boundary have agreed to participate in planting activities to rehabilitate the recently disturbed area by the agent of deforestation. One small area in the northern area was planted in 2013 and an additional 60+/- ha was planted in 2014 for the Kulak Batu village. An additional 150 +/- ha was planted in the Central Unit for Muara Dua village.	Aug-13	On-going		RRC Project Manager
Water conservation, improved irrigation techniques	Planned	An irrigation system was installed in the Ulak Batu nursery in 2014 and other evaluation of irrigation options were explored in Jahitan and Baung villages.	Aug- 14	On-going	Planning and Allocation of funds	RRC Project Manager
Soil enrichment with Biochar	Planned	Nothing has been done to date.	TBD	TBD	Planning and Allocation of funds	RRC Project Manager
Crop diversification, harvest rotation and application of new technologies for improved production	Started	Farmers Field Schools have been held in 6 villages and both Ulak Batu and Muara Dua have established multi-species nurseries for the agro-forestry program in 2014.	May-13	On-going	Individual village spatial and economic plans and allocation of funds.	RRC Project Manager
Aquaponics	Planned	One village used their community development stimulus funds for fishing nets, field cages have been established and efforts to improve and market the production of shrimp paste in Sungai Perlu has all been done in 2014.	TBD	TBD	Planning and Allocation of funds	RRC Project Manager

Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
Community education and provide access to clinics to provide better access to healthcare	Started	A health assessment was undertaken by Alam Sehat Lestari in September 2013. This report identified major health issues, root causes of those issues and suggest a plan forward. Only preliminary discussions have begun with the medical community to Indonesia relating to potential staffing of a floating clinic in 2014.	Sep-13	On-going	Prioritise suggested actions. Set up a budget and plan to implement actions.	RRC Project Manager
Protect and manage large patches of contiguous forest	Started	The project has avoided the conversion of approximately 44,263 hectares of peat swamp forest to palm oil. Additionally the Project has completed the demarcation of the ecosystem restoration concession (ERC) boundary which has now been submitted to the Government for the final stage of the ERC licence. This will be the first of its kind in Indonesia.	2009	On-going	Annual remote sensing and ground based measurements as described in the monitoring plan. Continual patrols along the ERC boundary demarcation.	RRC Project Manager

Table 21: Community and Biodiversity Related Activities

4 COMMUNITY

4.1 Net Positive Community Impacts

4.1.1 Community Impacts (CM1.1)

The project's community benefits represent a net positive benefit for all community groups. Attaining positive impacts on communities within the project zone has been an extremely important aspect of this project. Nearly every step of the project has involved the feedback and participation of community members in one form or another. Community members have been vital to the design and implementation of the project. Without the feedback and participation of community members, this project would not exist. Project activities have been designed to incorporate community needs and concerns so that the project may be truly impactful not only in terms of climate and biodiversity objectives but in terms of community goals.

Furthermore, these benefits have been provided in a manner which has maintained one of the most important local assets of the project communities: the natural capital of local forests and the ecosystem services they sustain. These resources have remained intact and available for current and future generations. This benefit is in direct contrast to livelihood opportunities that would have been generated through the palm oil conversion, through which the area's natural capital would be eroded and become unavailable over a relatively short period of time. To evaluate these benefits, impacts were analyzed using the United Nation's Millennium Development Goals, and more recently, the project has begun to implement the use of the Theory of Change framework as a tool for community project activity design and monitoring.

Throughout the Theory of Change (TOC) exercise, the Rimba Raya project identified four broad categories for all project activities that are being implemented. These categories are Access to Resources, Education, Inclusion, and Enterprise. On a broad level, these categories also work to address the Millennium Development Goals identified below. By providing access to resources, education, inclusion, and enterprise, the project activities can directly improve the well-being of communities within the project zone. A detailed TOC model was developed in order to trace both the positive and potential negative impacts that project activities might have on communities (for example see the TOC models for Chicken Farm and Water Filter). While the MDGs are important targets for the project to aim for, it is important to consider the specific dynamics of the communities and their individual needs in order to minimize the negative and optimize the positive impacts. For this reason, the project is focusing on using the TOC as a tool going forward to achieve its specified community objectives, including the MDGs listed below.

The Millennium Development Goals (MDGs) are the world's short-term, quantified targets for addressing extreme poverty in its many dimensions – income poverty, hunger, disease, lack of adequate shelter and exclusion – while promoting gender equality, education, and environmental sustainability. They are also basic human rights – the rights of each person on the planet to health, education, shelter, and security. In an effort to create a social buffer for the project area and nearby Tanjung Puting National Park, InfiniteEARTH has designed many project activities

around targets and success indicators proposed by the MDG program for Indonesia. The project has worked and continues to work to accomplish these goals and ensure that the net impact of the project on communities within the project zone is positive. The MDG success indicators include:

- Goal 1: Eradicate extreme poverty and hunger
- Goal 2: Achieve universal primary education
- Goal 3: Promote gender equality and empower women
- Goal 4: Reduce child mortality
- Goal 5: Improve maternal health
- Goal 6: Combat HIV/AIDS, malaria and other diseases
- Goal 7: Ensure environmental sustainability
- Goal 8: Develop a Global Partnership for Development

The project has also identified clear objectives related to the protection of poor and marginalized individuals within communities. As discussed in Section 2.1.1 and Section 4.4 the three new community objectives are as follows:

- At least 25% of the poorest people in each community where the project works will benefit from the project
- Engage with 25% of the poorest people in each community that the project works with to identify and overcome barriers and risks to project benefits
- Avoid or mitigate negative impacts in each community that the project works with, including for the women, as well as poor, vulnerable, or marginalized individuals.

Millennium Development Goals were used as key rationale to assess the project's progress in terms of community benefits because they are the standards created and used by the United Nations to address the universal needs of the world's poorest. Although Indonesia is the largest economy in Southeast Asia and has made considerable advances in recent years in reducing poverty among its inhabitants, it is still considered a medium development country where many inhabitants, especially those in rural areas are directly affected by poverty. The location of the project, in the rural Seruyan Regency of the province of Central Kalimantan, has been identified as one of the poorest districts in Indonesia.

Seeing as communities within the project zone are some of the world's most impoverished people, application of these development goals are appropriate. Moreover, the MDGs encompass issues which are directly pertinent with those that have arisen within the project. Thus, inclusion of the MDGs makes sense as their ultimate purposes are almost entirely the same as those outlined by the project, and they are part of a pre-approved and applied system. Greater detail

about how the project activities work to reach the Millennium Development Goals and Indonesia's Sustainable Development Goals can be viewed in section 2.1.10 of this report.

Community Groups

The project was designed to include communities affected by activities which occur within the project zone. Communities have been defined as all groups of people, including Indigenous peoples, migratory, and other local groups who live within or adjacent to the project zone, as well as any groups that regularly visit the area and derive income, livelihood, or cultural values from the area. Using this definition, project community groups which were previously identified in the validated PDD include:

1. Communities in the Project Zone - Communities with land rights in the project zone. These include villages along the Seruyan River, which forms the eastern border of the project.

2. Communities that travel to the Project Zone **-** Communities in which certain individuals travel some distance into the project zone to log, hunt or collect forest products.

Planned and Unplanned Impacts on Community Groups

During this monitoring period, project activities created significant planned and unplanned impacts on the above-identified community groups. Impacts from some of the project activities are described below, and a full analysis of the activity outputs, outcomes, and impacts is shown in TOC Activity Matrix v1.10.xlsm. While communities in the project zone that were engaged in the project had the opportunity to provide feedback and shape the project positively in their favor, communities that travel to the project zone were impacted both positively and potentially negatively. Positive and negative impacts which occurred and affected both groups were both planned and unplanned. Project activities that were carried out during this monitoring period and their impacts on community groups are further explained below.

Construction and operation of Guard & Fire Towers and Orangutan Care Facilities

For both communities within the project zone and communities that travel to the project zone, the construction and operation of the guard and fire towers, as well as the orangutan care facilities provided positive impacts in the form of employment opportunities, and thus alternative streams of revenue. It should be noted that individuals within the project zone were given priority during the hiring process. Providing employment opportunities was a planned impact for community members. Community members from outside of the project zone which traveled to the project zone in order to illegally log may have been negatively impacted by the project because they were no longer allowed to log and there was security present to deter them from logging. No unplanned impacts on community groups were found as a result of these developments.

Fuel-Efficient, Low Emissions, Biomass Cook Stoves, Bio-Char Kilns, & Solar Lighting

The provision of fuel-efficient, low emissions, biomass cook stoves was a planned project activity which both positively and negatively impacted communities within the project zone. Stoves were made available for households within the project zone. These stoves require less firewood

collection and are less of a health hazard in terms of air quality. For communities within the project zone, this provided a planned impact which was positive because it helped to improve health conditions, notably for women who are most often responsible for cooking.

However, it was unplanned that many households within project zone communities would reject the cook stoves because they were not large enough and were perceived as being insufficient in the way food was cooked. In this sense, there were some negative impacts because households did not end up using the safer cook stoves and were still subject to the harmful conditions of traditional cook stoves. For communities that traveled to the project zone, there was little to no impact on their activities as they likely continued to travel to the project zone in order to log or collect firewood.

Distribution of Water Filters

Recent years have seen increased flooding in the Seruyan River watershed, and Project zone communities have had trouble gaining access to clean water resources. Based on community surveys intended to help project proponents prioritize social programs, it has been determined that clean water is one of the largest priorities for those living in the communities. To date, 1,872 water filters have been distributed to 9 of the villages in order to improve the health of communities within the project zone. The anticipated impacts of water filter distribution were multifaceted. By distributing water filters, some of the short-term outcomes that were expected included fewer sick days for adults and children, lower medical costs for families due to fewer illnesses, an overall reduction in waterborne illnesses, and improvements in water quality throughout the project zone. Longer-term impacts were identified that included benefits to the local economy due to higher worker productivity, empowerment of vulnerable or marginal groups due to the knowledge gained from trainings on water filtration systems, reduction in maternal illnesses and infant mortality, and the distribution of benefits to poorer and more vulnerable groups. Some negative identified impacts were the dependence on spare parts for water filtration systems that might not be locally available, however the project has worked to mitigate this need by supplying and providing access to spare parts when needed.

An example of the Theory of Change outputs, outcomes, and impacts for this activity is illustrated in TOC Activity Matrix v1.10 - Water Filter.pdf.

Carbon, Community, & Biodiversity Monitoring

For both communities within the project zone and communities that travel to the project zone, CCB monitoring provided positive impacts in the form of employment opportunities, and thus alternative streams of revenue.

Providing employment opportunities was a planned impact for community members inside the project zone, as well as those who traveled to the project zone. It should be noted that individuals within the project zone were given priority during the hiring process. Concerning unplanned negative impacts on community groups, none have been found or reported as a result of CCB monitoring. In fact, community members have been able to benefit in unplanned ways, such as allowing villagers to rent the boats used for monitoring when they aren't required for their main

purpose.

Capacity Building Programs

Capacity building efforts implemented planned positive impacts on both community groups. Capacity building allowed community members within the project area to train and pursue the learning of alternative skills and livelihood capabilities. In expanding worker skills sets and abilities, community members located within the project zone were positively influenced as they were then able to advance their socio-economic statuses. Likewise, community members that traveled to the project zone also positively benefited from planned capacity building programs as they were able to participate in the programs in order to develop alternative livelihood skills and pursue opportunities that would not be available without the presence of the project. There were no negative impacts on either community group due to the implementation of capacity building programs and no unplanned impacts have been found or reported.

Community center and library construction

The building of the community center/library was a planned project activity which created positive impacts on both communities within the project zone and communities which traveled to the project zone. Both community groups benefited from the construction of the center because it provided employment opportunities (construction) and upon completion, provided a communal space for congregation and learning since everyone is welcome. However, there was one negative unplanned impact in that this structure has resulted in some jealousy in communities that don't have their own community center, even though they're allowed to use it. However, Rimba Raya hopes to address this through the establishment of additional libraries, including a mobile library through the resource boat.

Micro-credit Programs

Micro-credit programs were planned project activities which provided positive benefits for community groups - those who lived within the project zone and those which traveled to the project zone. Micro-credit programs provided financial and entrepreneurial support so that various working groups – shrimp paste, salt fish, chicken meat, and chicken egg production – could operate. In doing so, community members from inside and outside of the project zone were able to make revenue from alternative, sustainable practices. Making money outside of the palm oil industry allowed community members safer, more empowered livelihoods. The increase in production of chicken farming was considered to have the potential negative effect of contaminating the water supply, however the project is taking measures to reduce this negative impact through its water filtration system and the monitoring of water quality in the project zone.

A full assessment of the impacts from chicken farming can be shown in TOC Activity Matrix v1.10 - Chicken Farm.pdf. The TOC model also shows the direct outputs, outcomes and impacts from all micro credit activities and how they positively impact communities.

Restoration Project through community based agro-forestry and aquaponics

Forest restoration through community based agro-forestry and aquaponics created

planned positive impacts on both communities within the project zone and communities that traveled to the project zone. Community based agro-forestry and aquaponics programs such as the pineapple plantation and shrimp paste programs allowed community members to be more financially independent and have greater access to food. There were no unplanned impacts and no negative impacts identified for either of the community groups.

4.1.2 Net Positive Community Well-Being Impacts (CM1.1)

As defined in the validated Project Description Documentation, the approach to demonstrate net community benefits in the Project area is based on an assessment of 'with' and 'without' project scenarios in relation to project goals. A description of how these goals are addressed in the baseline scenario compared with the project scenario is summarized below.

BASELINE SCENARIO

Goal 1: Eradicate extreme poverty and hunger

Palm oil is Indonesia's second most successful agricultural product, after rice, and the largest agricultural export. It provides a means of income and economic development to a large number Indonesia's rural poor[6]. With over half of Indonesia's population living in rural areas—of which over 20 percent live below the poverty line—the palm oil industry provides an incomparable means of poverty alleviation (Budidarsono, et al , 2013; Norwana; et al 2011). It allows small landholders to participate in the cash economy and often results in improvements to local infrastructure and greater access to services. In some areas, the cultivation of oil palm has replaced traditional practices, often due to the higher income potential of palm oil (Budidarsono, et al , 2013; Norwana; et al 2011).

However, in some cases, land has been developed by oil palm plantations without consultation or compensation of the indigenous people occupying the land which has led to conflict, including conflict in Indonesia. Additionally, some Indonesian oil palm plantations are dependent on imported labor or undocumented immigrants, which have raised concerns about the working conditions and social impacts of these practices[7].

Plantations systematically destroy the rainforest land that the local people depend on; communities are continuously finding themselves with no choice but to become plantation workers. Faced with poor and degrading working conditions, they often earn barely enough income to survive and support their families. Instead of being able to sustain themselves, indigenous communities become reliant on the success of the palm oil industry for their income and survival, leaving these community members incredibly vulnerable to the world market price of palm oil which they have no control over. In the baseline scenario, the majority of community members - would continue to depend on the palm oil industry for employment.

[6] See 'the Economic benefit of Palm oil to Indonesia. A report by World Growth. Available at http://worldgrowth.org/site/wp-content/uploads/2012/06/WG_Indonesian_Palm_Oil_Benefits_Report-2_11.pdf

[7] See Ghosts of our Land. Indonesian oil plam smallholders and the roundtable on sustainable palm oil. Forest Peoples Programme. Available at: http://www.forestpeoples.org/sites/fpp/files/publication/2011/02/ghostsonourownlandtxt06eng.pdf.

This would likely be the case for the two identified community groups in the project – those communities living in the project zone and those which travel to the project zone for logging, hunting or for collecting non-timber forest products. Prior to project creation, the area in which the project area exists was part of several concessions that were planned to become a palm oil plantation. Therefore, it can likely be assumed that in the absence of the project, the land would have been converted to palm oil plantation. Community members living in the project zone would likely become employed by the palm oil company and lose their local forest. This would leave them vulnerable to the associated palm oil industry issues, as described above. This would include vulnerability to poverty and hunger. Likewise, community groups that did not live in the project zone but traveled to the project zone for logging, hunting and non-timber forest products (NTFP) would either see the same fate as community groups living within the project zone (employed by the palm oil industry, losing their local forest and being susceptible to poverty and/or hunger) or they would travel elsewhere to access forestland for logging, hunting and NTFP and likely, to access employment as well. With the absence of these plantations, it is likely that fewer people from outside the area moved into the project zone for employment. However, those that have traveled to the project zone are eligible for employment in the Rimba Raya Project. Additionally, while they are discouraged from conducting illegal deforestation in order to secure the project area, they are permitted small harvests like all other community members, and are granted the same access rights for hunting and NTFP

Goal 2: Achieve universal primary education / Goal 4: Reduce child mortality / Goal 5: Improve maternal health

Whilst the development of lands into palm oil plantations can be associated with increases in other services, an Indonesian study has found that access to elementary schools and medical facilities was similar for communities who rely on oil palm compared to communities who don't. However, distances to schools, hospitals and other medical services were significantly higher in communities relying on oil pam industry compared to those who don't. This was likely because the communities which rely on oil palm are more remote, public/government facility developments are not prioritized in these remote areas (Budidarsono, et al , 2013), and the oil palm plantations are not filling the gap in providing these services.

Furthermore, community members working in oil palm plantations are often women and children. The jobs associated with harmful health practices, such as the spraying of pesticides, is often performed by women and children as it seen as less laborious[8]. This contributes to worsening health conditions for women and children due to employment by palm oil.

Under the baseline scenario, these conditions for women and children of both community groups (groups which live in the project zone and groups which travel to the project zone) would likely continue. As such, access to education would be limited and health conditions for women and children would continue to decline.

Goal 3: Promote gender equality and empower women

[8] See http://www.ran.org/campaigns/rainforest_agribusiness/resources/fact_sheets/hostile_harvest_us_agribusinesses_and_labor_rights_abuses/

In the baseline scenario, work in oil palm plantations is hard for both men and women, though quite different. It is quite frequent that women help their husbands in the plantations to meet demanding production quotas, usually doing unpaid work. In the baseline scenario, this would likely be applicable for both community groups – those which lived in the area which would be the project zone and those which traveled to the area which would be the project zone.

In the case that women work on a hired basis, they often receive lower wages than men. This discrimination is set on the grounds that their work is easier than that of men. According to an article by Rainforest Action Network[9], women are often assigned tasks that seem less onerous, but which are actually more dangerous and physically demanding than that of their male counterparts. In Indonesia, women are often designated to spray pesticides because it is less physically taxing than other plantation work. Unfortunately, they are rarely given proper protective gear like gloves and masks and thus are susceptible to becoming sick or injured by the dangerous chemicals present in most industrial pesticides and insecticides.

Outside of working in the palm oil plantation, women fulfill other roles. In the baseline scenario women have to take care of the children, prepare food and collect firewood and water, (which are often made farther due to destruction of the forest by the oil palm plantations). While women are rarely the heads of households, they often are responsible for the management of a functioning household. If working, such as at a plantation or helping out in the processing of fish products if their husbands are fishermen, when they return home, women have to prepare food for their families, often with pesticide residue still on their skin and clothes[10]. Women, whether working or not, are still responsible for the management of the home and children, with little time, resources, or opportunity for other ventures, private activities, or means of personal investment/empowerment. For working women that are part of community groups that travel to the area where the project area would be, even more time would be spent traveling to and from the plantations.

Under the baseline scenario, these conditions for women (in both identified community groups) would likely persist as palm oil plantations dominate the employment opportunities and there would likely be not many, if any, opportunities to become financially independent or programs which promote the empowerment of women.

<u>Goal 6: Combat HIV/AIDS, malaria and other diseases</u>

Plants that may help treat or cure diseases such as cancer, AIDS and malaria have been found in the forests of the heart of Borneo, but the realization of these plants' medical potential is at risk due to wide scale conversion of natural forests to palm oil plantations[11].

According to WWF[12,] 422 new plant species have been discovered in Borneo in the last 25 years, and many other species are waiting to be found and studied, some of which could hold potentially

[9] http://wrm.org.uy/oldsite/bulletin/134/Indonesia.html
[10] See http://www.ran.org/campaigns/rainforest_agribusiness/resources/fact_sheets/hostile_harvest_us_agribusinesses_and_labor_rights_abuses/
[11] See http://news.mongabay.com/2006/0426-wwf.html#6YKqycezKKq4g470.99

important medical properties. However, these promising discoveries could be eventually lost if the disappearing rainforests of the heart of Borneo are not adequately protected.

Scientists are currently testing samples collected in the Malaysian states of Sabah and Sarawak, as well as in Kalimantan, the Indonesian part of Borneo. They hope to develop drugs that could contribute to the treatment of major, deadly human diseases.

Scientists have found a unique chemical in latex produced by the Bintangor tree which is endemic to Indonesian rainforests. The compound, Calanolide A, appears to be effective against the replication of the Human Immunodeficiency Virus (HIV), as well as the tuberculosis bacterium, which affects many AIDS patients. The discovery is particularly important as, to date, no single drug has been able to treat both HIV and TB. If clinically proven, Calanolide A could be a major development for the health of many millions of people worldwide.

Researchers have also found a powerful and previously unknown anti-malarial agent in the bark of a local tree traditionally used by the Kenyah people of Kalimantan to treat malaria. The substance — a triterpenoid — apparently kills the human malaria parasite Plasmodium falciparum in laboratory tests.

The report notes that more forest destruction (as is expected under the baseline scenario) could well deny science the opportunity to discover and develop further potential sources of life-saving medication.

Within the communities themselves, especially rural communities, medical and health services are often difficult to access. Palm oil plantations, which often dominate the existence of many rural communities, often do not provide these services to their employees. Therefore, community members themselves lack the resources for disease treatment. This would likely affect both community groups – those living inside the area that would be the project zone and those which travel to the area that would be the project zone. Notably, with community groups that travel to the area that would be the project zone, distance would be increased and thus access to health care and medical assistance would be increasingly difficult to reach.

Under the baseline scenario, conversion of tropical peatland forests to palm oil plantation would continue to destroy forests whose plants may hold cures and treatment abilities for some of the world's most deadly diseases. Likewise, continuation of all types of community members lacking access to proper medical care would likely also occur under the baseline scenario.

<u>Goal 7: Ensure environmental sustainability</u>

Although the rapid expansion of the palm oil industry in recent decades has generated considerable economic growth in tropical developing countries, this development has come at an extremely high cost to the environment (Fitzherbert et al., 2008; Danielsen et al., 2009).

Millions of hectares of tropical forests have been destroyed to make way for oil palm plantations (Koh et al., 2011), in the process destroying critical habitat for endangered species, including

[12] Biodiscoveries. Borneos Botanical Secret. World Wildlife Fund. Available at: http://wwf.panda.org/about_our_earth/all_publications/?71901/Report-Biodiscoveries-Borneos-Botanical-Secret

orangutans, tigers, elephants, and rhinos. The serious environmental challenges associated with palm oil production include:

- Biodiversity loss, including loss of rare and endangered species
- Pollution of soil, air, and water
- Soil erosion
- Greenhouse gas (GHG) emissions and climate change
- Loss of key ecosystem services

Deforestation also has significant social implications and can be very damaging for the communities that depend upon these forests for their livelihoods (Colchester, 2011). Serious conflicts can arise when palm oil companies disregard the rights of local communities. Social impacts of palm oil production can include:

- Land grabs
- Loss of livelihoods
- Social conflict
- Forced migration
- Loss of social/cultural identity associated with land
- Loss of access to non-timber forest products

Under the baseline scenario, continued deforestation would be expected. Correspondingly, the detrimental social and environmental effects which accompany deforestation would also persist for both community groups – those living in the area that would be the project zone and those which travel to the area that would be the project zone for hunting, logging, and collection of NTFP. Specifically, both groups would need to travel elsewhere, likely farther in distance, in order to access forests for their needs.

Goal 8: Develop a Global Partnership for Development

In the baseline scenario, the area which would comprise the project area would likely be converted to palm oil plantation. Although Indonesia has been working towards creating a sustainable palm oil industry, the country as a whole has a long way to go. As of 2017, only 12% of the approximately 11.9 million hectares of palm oil plantations are Indonesia Sustainable Palm Oil (ISPO) certified[13]. ISPO standards require producers to fulfill certain environmental as well as labor and social standards; implementation of these standards helps to create a global partnership for development as it promotes international principles centered on sustainable social

[13] See http://www.thejakartapost.com/news/2017/04/12/only-12-of-indonesias-oil-palm-plantations-ispo-certified.html

development for impoverished communities worldwide. Because ISPO corresponds with UNDP (United Nations Development Program), which created the Sustainable Development Goals, the baseline scenario would only meet the goal of developing a global partnership for development if the plantation met the ISPO requirements.

If this were the case, community groups (both those in the area that would be the project zone and those who travel to the area that would be project zone) may receive fair social and labor treatment if employed by the plantation. In doing so, this would contribute to Indonesia's progress in developing a global partnership for development.

However, because sustainable palm oil production is currently a very small percentage of the country's output, it is more than likely that the palm oil plantation that would be developed in the absence of the project would not be sustainable under ISPO standards, only two of which are located near the project area. While several plantation companies in Central Kalimantan are ISPO certified, only two near the project area, PT Bangun Jaya Alam Permai & PT Wana Sawit Subur Lestari, have received their ISPO certification as of 2016. Both are located just north of TPNP. Also, as of 2016, only 132 companies of the 562 companies[14] that applied for certification had received an ISPO certification. Thus, it is likely that the proposed plantations in the plantation scenario would likely not provide environmental, social and labor related rights to both identified community groups that would be employed as plantation workers.

[14] http://www.majalahhortus.com/hukum/item/213-46-perusahaan-sawit-terima-serifikat-ispo.html

PROJECT SCENARIO

In comparison with the expected community conditions under the baseline scenario, the project scenario demonstrates the net positive community benefits that are expected and that have been created by the presence of the project. A Theory of Change exercise was conducted in order to demonstrate the causal relationship between project activities and their direct and indirect impacts and is summarized in Table 22 below. By identifying each project activity's outputs and short-term outcomes, it was possible to then link these to longer term impacts within the project zone that are consistent with the Millennium Development Goals that were outlined for the project.

The project has had an overwhelmingly net positive impact on communities within the project zone, as is summarized below:

Goal 1: Eradicate extreme poverty and hunger

In operating under the presence of the project, the eradication of extreme poverty and hunger has been a primary objective. As identified in the baseline section above, the creation of palm oil plantations is dualistic. While palm oil plantations have provided employment opportunities for many of Indonesia's citizens, they often cause a lot of harm by encroaching without consultation on indigenous and/or community forests that are depended upon for survival. Often imposing degrading and unsafe working conditions, palm oil employment creates a paradigm where communities are dependent on unfair and unsustainable systems and are left vulnerable to business and market changes.

The implementation of the Rimba Raya project has been influential in reducing local poverty and hunger by creating sustainable and self-reliant forms of employment and food production for communities living in and that travel to the project zone. Among the most prevalent project activities that contribute to accomplishing this objective are project related employment opportunities through climate/biodiversity monitoring, guard patrols and fire brigade/ firefighting. These positions are directly involved in the maintenance of the project thus they provide an opportunity for community members to contribute to a larger system that, in turn, directly and decently benefits them. Additionally, the project has made significant headway in the development of chicken farms to provide communities with stable sources of protein, along with the cultivation of vegetables, production of shrimp paste, and the production of salty fish. These diversified food sources provide new opportunities for employment within the communities, and increase the resilience of communities food supply.

With regards to employment through Rimba Raya, community members are given priority for these positions and positions are made available throughout the year for various needs. The demand for these positions is ongoing, thus workers are not vulnerable to changes in production or market influences which may render them jobless. The project strictly exercises operational safety techniques and trainings so that employees remain protected while working. Furthermore, the project ensures that labor rights are being appropriately applied at all times and that workers

are made aware of their rights. When employed by sustainable means where workers are protected and conditions are safe, community members have been able to lift themselves out of extreme poverty.

Other project activities which have contributed to the reduction of extreme poverty and hunger include community based agroforestry programs, establishment of fisheries and micro-credit programs, access to clean water mechanisms, and capacity building programs such as the Farmer Field School.

During this monitoring period, 0.6 ha of pineapple and djemgkol have been grown using sustainable agroforestry techniques. This has provided community members with food and with opportunities to sell food to make additional income. Likewise, establishment of the microcredit program has allowed financial support and training for community members, notably women, to create working groups which allow them to create alternative streams of revenue and additional food security. Because of funding for the micro-credit program, working groups have been established for producing and selling shrimp paste, salt fish, chicken meat/egg and recycled souvenirs.

Capacity building exercises have been included as part of implementing many of the above project activities. For example, the Farmer Field School is a learning-based interactive communal activity created to improve skills of adults of the project communities working as farmers, fishermen, livestock breeders and businessmen. The Farmer Field School operates as a learning-based approach which has helped community members to launch and successfully carry out the community agroforestry program as well as all of the working groups involved in the micro-credit program. More details and results relating to this form of capacity building can be viewed in 20170911 draft laporan COMDEV _ Audit 2017 REVISI-OK.docx.

In creating long-term and rights-oriented employment, coupled with alternative sources of food production and income generation, the eradication of extreme poverty and hunger has been made increasingly possible within the presence of the project.

<u>Goal 2: Achieve universal primary education /Goal 4: Reduce child mortality / Goal 5: Improve maternal health/ Goal 6: Combat HIV/AIDS, malaria and other diseases</u>

The secondary community goal – achieving primary education – by and large affects the 4th, 5th, and 6th community goals, to reduce child mortality, improve maternal health, and to combat diseases. As described above in the baseline scenario, availability of schools and medical facilities are often limited for communities entrenched in working for the palm oil industry. Also, women and children frequently end up working on oil palm plantations due to a lack of other opportunities, often in positions that have hidden risks such as spreading pesticides. In contrast, the project has been effective in making these services available to community groups and to provide other opportunities and interests for villagers to pursue. By putting a focus on such activities, these goals are much further advanced within the project area than they would be under the baseline scenario.

The table above (Table 22) provides a few ways in which this project has made steps towards

achieving these goals. Two village libraries were developed in Ulak Batu and Muara Dua during this monitoring period, along with the development of a community center in the project area. In addition to serving as a library that can provide educational materials, a community center also serves as a meeting space where villagers can meet with each other and training events can occur. Such events can build social and human capital within these communities as relationships are strengthened and knowledge is spread. Women and children especially benefit from community centers and libraries in comparison to the baseline scenario, since instead of many of them working on palm oil plantations, they potentially have more free time to pursue other activities. These activities have provided places for them to learn about healthcare and ways they can take care of their own health and the health of their community as a whole. These will make it much more likely that child mortality will be reduced and maternal health will improve than would be possible under the baseline scenario. They also provide areas for training on the transmission of diseases and ways to reduce the risks.

The distribution of water filters, cookstoves, and solar lamps have also helped towards the advancement of these goals, especially goals 4 and 5. So far, 1,872 water filters have been distributed within the project area. By providing easy access to clean water, they've reduced the likelihood of getting sick due to the consumption of dirty water, to which children are especially susceptible. Likewise, the distribution of cookstoves and solar lamps have reduced the amount of wood burned within homes, which will improve long-term health by providing cleaner air within homes. The benefits go further than this, though, since both these activities have made managing a household more efficient. Instead of spending so much time collecting firewood and clean water, members of households that are typically given these tasks, usually women and children, have more time to pursue other activities. With the additional educational resources in the region, some of this additional time will be spent pursuing new educational opportunities. Additionally, this will allow women more time to spend teaching their children, which will be simpler at night due to the convenience of solar lamps. Not only are these activities providing straightforward health benefits, but they also allow for additional long-term benefits that will have a positive impact on community members.

<u>Goal 3: Promote gender equality and empower women</u>

As described in the baseline scenario, women within the project zone are primarily responsible for all of the household tasks, regardless of whether or not they have direct sources of employment. Women who are given jobs are also often paid less than men, and are exposed to hazardous working conditions that include exposure to pesticides and other dangerous chemicals used within palm oil plantations. Women are also often excluded from decision making processes within communities and are left with few alternative forms of employment from the often dangerous work in palm oil plantations.

The project is focusing on providing work that is specifically geared towards women within the project zone in order to provide them with alternative forms of employment and to enable them to have direct agency over the work that they do. Women are being directly involved in the project's micro-credit program, which serves to empower women with financial knowledge and benefits in order to start their own enterprises. The direct outcomes of these kinds of programs are an increase in women throughout the project area that are financially self-sufficient and

pursuing alternative forms of employment that provide sustainable income sources. Financial independence for women is often the first step towards greater autonomy and independence.

Goal 7: Ensure environmental sustainability

The baseline effects of deforestation within the project zone would be devastating to the environment and would have severe negative impacts on communities as well. The conversion of peat forests and shrubland to plantations would degrade the soil and water quality throughout the area, having detrimental impacts on the health of communities. Additionally, deforestation from palm oil companies would likely spur the displacement of local people, the loss of livelihoods and ancestral lands, as well as a loss of access to essential non-timber forest products.

By providing local communities with sustainable forms of employment throughout the project zone and protecting the forest within the project area from conversion to palm oil plantations, the project has mitigated many of the negative impacts expected in the baseline scenario. Communities have been able to maintain or improve their livelihoods and retain their access to land, while maintaining goals for sustainable development.

Goal 8: Develop a Global Partnership for Development

The final Millennium Development Goal is the development of global partnerships. This has been a goal of the project proponents so that the project may be strengthened by engaging with a wide range of stakeholders that can provide expertise and long-term support. From the beginning, a key component of the project has been multi-stakeholder support for all projects. Forest and biodiversity protection were designed with support from OFI, which has been working in TPNP since 1986. Educational goals and the establishment of the various working groups for the project were implemented through World Education, which was established in 1951. By developing working groups made up by local community members, this has provided these villagers with opportunities to connect and discuss their ideas with an international community they didn't have access to before. Both of these are international organizations that have staff in the area that have been working there for many years. They know both community development in the region and how to connect with other international organizations.

Since these organizations already worked in the area prior to the project implementation, they would likely be continuing their work there without the project. However, support from Rimba Raya has been critical for the expansion of new activities within the region. In many cases, Rimba Raya has provided financial and organizational support, such as for the chicken farms and conservation handicrafts working group. This has allowed these organizations to use their experience and expertise to increase the effectiveness of these projects. One great success of this project has been due to the commitment from the beginning to work with international organizations in helping local villagers create their own institutions and organizations that have allowed them to connect with the global community. This is being done much more frequently than would have ever been possible if the project area had been converted to palm oil plantation.

Indicators and monitoring results with respect to the effectiveness of community-related activities are based on the activities, outputs, outcomes and impacts for each community-related project

activity area. The table below demonstrates the linkage between these activities and overall community impacts as demonstrated through the progress made during this monitoring period.

Project Activity	Output (from this monitoring period)	Outcome (from this monitoring period)	Impact
Employment opportunities through Monitoring activities	3 completed guard posts built, one each in the North, Central, and South Unit 1 fire tower is being planned	Increased employment of community members. Increased number of community members with alternative revenue streams. Completed three additional guard posts.	Eradicate extreme poverty and hunger
Community based agro-forestry	0.6 ha of pineapple and djemgkol growth	Development of community based food sources	
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of community members with access to clean water. Decreased number of community members becoming ill due to water-borne and sanitation-related illnesses	

Fisheries: same as for water above, plus planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	Development of 1 floating cage system and 10 fish ponds that are 6 m^2 each. 10,000 juvenile catfish were introduced.	Development of community based food sources	
Micro Credit Program	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of community members (notably women) pursuing independent, sustainable sources of income based off of learning new skills/knowledge. Increase in independent food production	
Supply of Solar Lighting	Distribution of 1,671 solar lantern, 11 units of 60 watt solar panels, 11 units of 1 kw solar generator	More households with access to light and electricity. Increased number of people that can read/study at night	Achieve universal primary education
Build community centers in strategically selected villages inside the Project zone.	Creation of 1 library inside 1 community center	Provision of a central community space and building for educational activities to occur/educational resources to exist. Increased number of people with access to educational spaces/educational material	

Extend World Education's ongoing programs for food security, access to government services, and capacity building within the project zone	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of community members (notably women) gaining skills and education from capacity building	
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of community members with clean water awareness and gained knowledge about safe drinking habits and sanitation	
Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns	15,310 hectares of forest continued to be protected within the 47,237 hectare project area	Increased awareness of the importance of forest protection and forest health	

Employment of women in project related employment	18 women hired for project activities 22 women involved in micro-credit program	Increased number of women that are financially self-sufficient	Promote gender equality and empower women
Fisheries: planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	Development of 1 floating cage system and 10 fish ponds that are 6 m^2 each. 10,000 juvenile catfish were introduced.	Increased number of women that are financially self-sufficient	
Micro Credit Programs	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of women pursuing independent, sustainable sources of income	
Women Capacity Building (peningkatan kapasitas perempuan)	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of women pursuing independent, sustainable sources of income	
Supply of fuel-efficient, low emissions, biomass cook stoves	99 fuel-efficient cook stoves distributed	Decrease in number of children sick/dying due to indoor air quality issues	

Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Decrease in number of children sick/dying from unclean water and issues related to open defecation/sanitation related sicknesses	Reduce child mortality
Supply of fuel-efficient, low emissions, biomass cook stoves	99 fuel-efficient cook stoves distributed	Decrease in number of mothers/infants sick/dying due to indoor air quality	Improve maternal health
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of people with access to clean water. Decreased number of people becoming sick/dying due to water borne illnesses. Increased awareness about water borne diseases, sanitation, and transmission of diseases through mosquitoes	
Employment opportunities through construction & operation of guard & fire towers	3 completed guard posts built, one each in the North, Central, and South Unit 1 fire tower is being planned	Increased forest protection. Increased employment in environmentally sustainable jobs	Ensure environmental

Employment opportunities through Orangutan Care Facilities	Finalized construction for 1 orangutan release camp in Tatah Slamet.	Increased protection for endangered orangutans and orangutan habitat	sustainability
Community based agro-forestry	0.6 ha of pineapple and djemgkol growth	Decrease in unsustainable forest clearing for agriculture. Increase in sustainable agro-forestry land	
Prevent further oil palm expansion; maintain and enhance remaining forests in the Project zone; possibly rehabilitate select riparian forest zones; prevent spread of forest fires, specially into peat areas with direct impact on water quality of the Seruyan	15,310 hectares of forest continued to be protected Replanting of 15 types of forest trees (80,000 seedlings planted).	Increase in forest cover in riparian zones. Increase in protection of already intact forests and peatlands	
Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns	15,310 hectares of forest continued to be protected 3 completed guard posts built	Increase in protected forest and peatlands from fire and palm oil development. Increase in awareness about importance of forest protection	

Buffer Planting Program	179,145 seedlings (more than 20 species) planted that are sourced from community-run nurseries	Increase in forest cover in buffer zone	
Prevention of forest loss by oil palm expansion and possible development of local bodies to manage communal forest areas in a more structured fashion to promote chances for long-term sustainability of forest areas	15,310 hectares of forest continued to be protected 0.6 ha of pineapple and djemgkol growth ensuring sustainable agroforestry development	Increase in sustainably managed agroforestry land. Improved community correspondence and collaboration in relation to long-term sustainable management	
Employment opportunities through Monitoring activities	Employment of 52 field staff and community staff from 14 villages	Increased number of people involved in climate, forest and biodiversity monitoring of forested areas	
Building materials: Prevention of forest loss by oil palm expansion and possible development of local bodies to manage local timber harvesting levels to promote chances for long-term sustainable supplies.	Planting of 80,000 seedlings (15 types of trees)	Increase in use of sustainable forest products. Decrease in deforestation/degradation for forest products creation	
Fuel wood: prevention of large-scale natural vegetation clearance for oil palm.	Distribution of 99 fuel-efficient cook stoves	Decrease in deforestation/degradation	

Extend World Education's ongoing programs for food security, access to government services, and capacity building within the project zone	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increase in correspondence and collaboration among community members and larger organizations involved in the project or making connections with project	Develop a Global Partnership for Development
Prevention of forest loss by oil palm expansion and possible development of local bodies to manage communal forest areas in a more structured fashion to promote chances for long-term sustainability of forest areas	15,310 hectares of forest continued to be protected 0.6 ha of pineapple and djemgkol growth ensuring sustainable agroforestry development. Replanting of 15 types of forest trees (80,000 seedlings planted).	Increase in correspondence and collaboration among community members and project partners with palm oil companies and other parties in the area	

Table 22: Summary of Theory of Change Exercise for Community Goals

Rimba Raya Collateral Benefits Programs	Meeting and Exceeding United Nations Millennium Development Goals for 2015							
	1	2	3	4	5	6	7	8
Roll Out Plan	2010	2011	2012	2013	2014	2015		
	0%	20%	40%	60%	80%	100%		

Construction & operation of Guard & Fire Towers and Orangutan Care Facilities	1 Indicators: #1-5		3 Indicators: #11		7 Indicators: #25-29		
	The construction and ongoing operation of the guard and fire towers and the orangutan care facilities provides substantial employment opportunities to the local community at well above subsistence levels wages. In particular, the orangutan care facilities will be staffed predominantly by women				Community staffed towers and care facilities creates a strong physical and social net around the project area and the adjacent Tanjung Putting Park		
Equal Opportunity Employment at Rimba Raya Reserve	1 Indicators: #1-5		3 Indicators: #11		7 Indicators: #25-29, 32		8 Indicators: #45-48
	Employ at least one member in 50% of all families in the project area by 2015		Target 50% of all employment for women		Create a social and physical barrier around the reserve by linking community welfare with conservation		Make local communities financial stake holders in the success of the project
Fuel-Efficient, Low Emissions, Biomass Cook Stoves, Bio-Char Kilns, & Solar Lighting	4 Indicators: #13-15				7 Indicators: #25-29		
	Indoor air pollution is a significant health hazard, particularly for pregnant women and children and can lead to long-term chronic health issues. The lack of adequate lighting prevents children from reading and studying during non-daylight hours when usually they are engaged in thefamilies horticulturalactivities.				A significant amount of pressure is placed on local forests by rural communities simply from basic fuel source needs for cooking and for light during the12 hour equatorial nights.		

Carbon, Community, & Biodiversity Monitoring	1 Indicators: #1-5	3 Indicators: #11	7 Indicators: #25-32
	Locally staffed monitoring programs provide capacity building and above subsistence level wages	Monitoring jobs are easily filled by women	As the adage goes: "What gets measured, gets managed"
Capacity Building Programs	3 Indicators: #11	7 Indicators: #25-31	8 Indicators: #45-48
	Capacity building programs will provide essential transferable skills, giving the community members, particularly women, viable new employment options	Nearly all of the capacity building programs are centered around conservation awareness and the skills necessary for the implementation of environmental initiatives	- Agriculture: World Education -Orangutan Conservation: OFI -Eco-Tourism: Seminole Indians -Micro-Finance: Yamida or MBK
Annual Grants to OFI, TPNP, Local Universities for Scientific Research	7 Indicators: #25-29	8 Indicators: #45-48	
	Funding of grants to local universities and NGOs for scientific research and linking them with outside organizations supports local capacity building and promotes local engagement in the conservation effort. Providing direct funding to the Tanjung Putting National Park Management Authority provides tangible additional protection and therefore significant positive leakage for/from the park (an area four times the size of the project area)		
Community Centers, Libraries & "Early Development" Program & "One Laptop per Child"	2 Indicators: #6-8		
	Make early childhood education and development programs available to every child in all communities within the project zone via learning materials in the community centers and through funding of trained instructors and training programs for instructors from the communities		
Immunization Program	4 Indicators: #13-15	6 Indicators: #21-24	
	Fund and promote malaria prevention methods, programs and related equipment to reduce the incidence of child mortality from malaria in the communities by half. Cut the mortality rate from tuberculosis amongst children and adults by half		

Phinisi Floating Clinic	4 Indicators: #13-15	5 Indicators: #16-17	6 Indicators: #21-24	
	Provide mobile Medical & Dental, Emergency medical, professional maternity care including birthing, and minor surgery to the communities along the Seruyan River			
Micro-Finance	1 Indicators: #1-5	3 Indicators: #11	7 Indicators: #25-32	8 Indicators: #45-48
	A portion of the revenue share with the local communities will be delivered through our micro-finance program. As with most micro-finance programs, ours will focus on women as the primary beneficiary group, funding programs such as the seedling/sapling greenhouse nurseries, small scale eco-tourism (home stays), poultry and small scale low impact aquaculture projects, etc. InfiniteEARTH will subcontract the administration of these programs to Yamida or MBK			
Restoration Project through Community Based Agro-Forestry & Aquaponics	1 Indicators: #1-5	7 Indicators: #25-29	8 Indicators: #45-48	
	Achieve restoration and reforestation goals through integrated natural forest re-growth with community based cash crop, multi-story mixed agro-forestry and low-impact aquaculture programs that alleviate hunger, poverty and pressures on the surrounding primary and secondary forests. Execute in cooperation and participation of the palm oil concessionaires (as JV partners) in order to address leakage risk.			
Community-Based Eco-Tourism	1 Indicators: #1-5	3 Indicators: #11	7 Indicators: #25-29	8 Indicators: #45-48
	Create a "sister city" (sister village) type program with the Seminole Indian communities in the Florida Everglades who have a long and successful history of community based eco-tourism based on indigenous cultures and swamp forests. From this collaboration and knowledge transfer, create a community based eco-tourism business for the communities in the project area through micro-financing program and through potential JVs with intl. groups			

Figure 23: Project Scenario Community Activities in Support of Millennium Development Goals

4.1.3 Protection of High Conservation Values (CM1.2)

Maintaining and enhancing forests and other natural ecosystems is key to protecting HCVs 4-6 and their associated sub-values in the project zone, as described and identified in the previously validated PDD. Community based HCVs that have been identified as present in the project zone are show in Table 24 below:

	High Conservation Value
4.1	Areas or Ecosystems Important for the Provision of Water and Prevention of Floods for Downstream Communities
4.3	Areas that Function as Natural Barriers to the Spread of Forest or Ground Fire
5	Natural Areas Critical for Meeting the Basic Needs of Local People
6	Areas Critical for Maintaining the Cultural Identity of Local Communities

Table 24: Protection of Community Based HCVs

Some of these HCV sub-values require attention to specific areas within the project zone, including: preserving mature forest for natural fire breaks near sources of fire in the south; protecting shoreline forest or other natural vegetation along Lake Sembuluh; rehabilitating riparian forest zones along the Seruyan and its major tributaries; and monitoring communal forest areas used for subsistence timber production outside of the Project area, but inside the project zone east of the Seruyan. Additionally, maintenance of some HCVs requires education programs for local communities, e.g. to reduce or eliminate the use of fire in the open wetlands in the south where it has been suggested that fishermen do this periodically to renew seasonal shallow water fishing grounds. In Table 25 below, progress made during this monitoring period by project activities targeted specifically at community HCVs is summarized.

Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
Prevent further oil palm expansion; maintain and enhance remaining forests in the Project zone; possibly rehabilitate select riparian forest zones; prevent spread of forest fires, specially into peat areas with direct impact on water quality of the Seruyan	on progress	No further encroachment for palm oil by PT BEST	Jan-15	Ongoing	Rimba Raya keeps conducting routine patrols to monitor and protect the prior encroachment area, and increase the patrols to several high risks/vulnerable area from encroachment, illegal logging and fire.	GM and CM
Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns	on progress	The project acknowledges that preventing fire is challenging, and has subsequently identified the location of posts and engagement and training of fire guards is urgent.	Jan-15	Ongoing	The project will continue to patrol and protect the boundaries and plans to increase the intensity particularly in the high risk areas.	GM and CM
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	on progress	Water quality has been maintained through prevention of further oil palm conversion and rehabilitation of disturbed areas in particular in the northern boundary.	Jan-15	Ongoing	Build a guard post in Natai kopi - Ulak Batu village and perform routine patrol	South Unit Manager
Fisheries: same as for water above, plus planned efforts to explore potential for facilitating communities to organize and	on progress	Developing fish work group by floating cage system in Seruyan river and fish pond system cultivation	Mar-17	Ongoing	Identify fish potency in Tanjung Rangas village and develop fish cultivation work group	Comdev Technical Staff

establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	on progress	Determining the fish size to develop salty fish program in Muara Dua village - Tampudau in order to provide sustainable production	Jan-17	Ongoing	Identify fish potency, including catching method, development of fish work group (after harvest period), arrange regulations/fish size for salty fish program	Comdev Technical Staff
Building materials: Prevention of forest loss by oil palm expansion and possible development of local bodies to manage local timber harvesting levels to promote chances for long-term sustainable supplies.	on progress	Perform replanting program for 15 types of forest trees for 80.000 seedlings in 112 Ha - mineral soil (Natai) and 564 in peat area	Jan-15	Ongoing	Identify replanting location, replanting/land model development, develop 2 nurseries in Ulak batu and Desa Muara Dua village, provide pulled-out seedlings form the forest	Biodiversity Technical Staff
Fuel wood: prevention of large-scale natural vegetation clearance for oil palm.	complete	Distribute water filter for 9 villages; clean drinkable water without cooking	Apr-16	Sep-16	Identify villages where there is no clean water provided/access and villages that use traditional cook stove - wood fuel. The biomass cook stove distribution was a pilot project to get feedback from the community and to find out their preference on stove type	Concession Manager and Unit Manager
	complete	Distribute 99 Friendly cook stove as pilot project	year 2013			
Prevention of forest loss by oil palm expansion and possible development of local bodies to manage communal forest areas in a more structured fashion to promote chances for long-term sustainability of forest areas	on progress	Develop village agreement and participatory mapping for traditional land use, and assist the village government in arranging the village development - medium term	Jan-15	Ongoing	Workshop in village level for village agreement and participatory mapping programs	Comdev Technical Staff
Buffer Planting Program	complete	179.145 Seedlings (more than 20 species) being planted within the concession and seedlings were purchased from village nurseries that are supported by individuals and families who provide the labor to grow the seedlings. This purchase price is developed from the effort and seedlings grown by	Jan-15	Feb-17	Identify replanting location, replanting/land model development, develop 2 nurseries in Ulak batu and Desa Muara Dua village, provide pulled-out seedlings form the forest	Biodiversity Technical Staff and Unit Manager

		individuals and families.				
Women Capacity Building *(peningkatan kapasitas perempuan)*	on progress	Pengembangan Kelompok Terasi Zuper,	Oct-14	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
	on progress	Develop handicraft work group in Telaga Pulang village - a women group who create souvenirs from reused garbage.	2014	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
	on progress	Provide financial support for Chicken meat and chicken egg work groups, plus local cooperative Itah development	Aug-16	ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager

Table 25: Progress of Community Based HCV Protection during the Current Monitoring Period

None of the planned project activities have had, nor are intended to have, a negative impact on HCVs in the Project zone. Project activities have been heavily focused on maintaining and enhancing forests and natural ecosystems, along with the environmental, social, and cultural benefits derived from them. Such activities have had a strong positive impact on HCVs 4-6. In the table below, key threats to HCVs and recommended project activities to address threats within the framework of the project are shown. The table identifies activities that have been undertaken and others that are planned for the future.

The project collected preliminary socio-economic data during the PDD development and this data has continued to be collected in order to determine the effectiveness of the project activities. One of the major stated objectives of the project has been to bring the most benefits the poorest people of the community. This data (a) allows the project proponent to identify by family, who these individuals are, and (b) focus or tailor efforts to ensure they are a major beneficiary of the positive results of the project activities. Additionally, women in Indonesia are known to primarily be located in the poorest quartile of citizens and the project has been and will continue to be focused on improving their lives through employment opportunities (non-field and hard labor related) as well as through specific project activities such as the micro-credit program.

HCV	Threats to HCV	Management Recommendation & Activities
4.1	Oil palm expansion and deforestation leading to continued pollution and degradation of the watershed draining into the Seruyan River on which communities depend for water & fisheries (see also HCV 5)	Prevent further oil palm expansion; maintain and enhance remaining forests in the Project zone; possibly rehabilitate select riparian forest zones; prevent spread of forest fires, especially into peat areas with direct impact on water quality of the Seruyan
4.2	Deemed not present	N/A
4.3	Continued fire, illegal logging, and oil palm expansion	Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns
5	Water: pollution and sedimentation of the Seruyan from oil palm; pollution from local human populations, in particular river use for sanitation purposes; conversion of riparian forests.	Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.
	Fisheries: same as for water.	Fisheries: same as for water above, plus planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.

	Building Materials: forest loss, especially through land clearance related to oil palm expansion, but also including small scale agriculture.	Building materials: Prevention of forest loss by oil palm expansion and possible development of local bodies to manage local timber harvesting levels to promote chances for long-term sustainable supplies.
	Fuel wood: forest loss (more data required on exactly where such fuel wood is sourced.	Fuel wood: prevention of large-scale natural vegetation clearance for oil palm.
6	HCV deemed unlikely but potentially present in the form of remnant natural forest areas east of the Seruyan (outside the Project area but inside the Project zone) that are managed communally for subsistence wood production; further research is required to understand if such forests have cultural meaning in addition to their utility as wood sources.	Prevention of forest loss by oil palm expansion and possible development of local bodies to manage communal forest areas in a more structured fashion to promote chances for long-term sustainability of forest areas.

Table 26. Threats and management recommendations for HCVs 4-6 in the Project zone

4.2 Offsite Stakeholder Impacts

4.2.1 Mitigation of Negative Impacts on Other Stakeholders (CM2.2)

Although the project was designed to positively impact the community, it was necessary to identify potential negative impacts on community members and other stakeholders. Potential negative impacts on stakeholders are described below along with mitigation techniques that would be employed if a negative impact did occur.

Subsistence Livelihoods

Project Proponents recognize that one of the fundamental components to Rimba Raya's success is the participation and support of affected communities. Villages have patterns of hunting and harvesting that are both steeped in tradition and contribute to local economies. Consequently, it is important that efforts at protecting the forest do not inadvertently infringe upon these activities. Concurrently, there are concerns that a reduction in regional palm activity would diminish employment opportunities on plantations, further harming local economies. Taken together, it is necessary to address possible negative community impacts from the project.

Although InfiniteEARTH has aimed to safeguard the forest against the incursion of palm oil plantations, there has not been an imposition of curbs to traditional modes of hunting and harvesting. InfiniteEARTH recognizes the economic and cultural value of such activities,

and does not seek to restrain them. In fact, curbs are largely unnecessary, as hunting and harvesting from the forest are not significant contributors to local economies. Moreover, the opportunity cost of jobs from palm is minimal, as most labor is hired from outside of local communities. InfiniteEARTH provides employment through the provision of social service and forest protection programs in order to offset any loss of livelihood due to project implementation.

Hunting

Communities in the project zone are predominantly Muslim. To that end, they tend not to engage in the hunting of bush meat – such as wild boar – that are common in other parts of Indonesia. Social surveys indicated that hunting is limited to deer which can be found in and around the project area. Animal protein is largely acquired through fishing in the Seruyan River and project area as well as the raising of poultry in villages. Potential negative impacts, though limited, may include stakeholders obtaining less animal protein in their diets because of the presence of the project and social pressures to not hunt within the project area.

However, negative impacts expected on stakeholders in terms of hunting have been limited because a) Hunting is not limited by the project because it contributes minimally to deforestation and forest degradation and b) the project activities related to the maintenance of local peat swamp and other forest types has actually helped to improve fish and game stocks used by communities. This is because the creation of the Reserve protects crucial habitat for game species which allows those species to flourish. Furthermore, project activities such as fishery creation and allocating micro-credit for shrimp paste and poultry production have provided community members with alternative sources of protein as well as avenues for alternative sources of revenue. Although the project proponent recognizes that there may be limited negative impacts on stakeholders in terms of hunting, the project proponent aims to mitigate these impacts through project activities.

Forest Harvesting

In the past, many communities planted dry rice and vegetables and collected rubber from rubber gardens in order to sell. Evidence of selective extraction for canoes and housing was found as well as expansion of subsistence gardens on degraded lands. From 2005 – 2008, however, monthly flooding limited their livelihood activities to fishing and palm sugar production (from the tree Arenga pinnata). Surveys indicated that project zone communities are not actively engaged in the harvesting of forest beyond simple usage. As such, the project does not inhibit community members from traditional forest harvesting practices because they do not substantially contribute to deforestation and forest degradation. However, it is recognized that potential negative impacts may include stakeholders partaking in forest harvesting less and less due to social pressures created by the presence of the project. As a result, this may contribute to a decrease in revenue streams for project stakeholders and other community members.

As a means to mitigate these potential negative impacts, the project has provided further revenue sources to the communities from sustainable activities; examples include the pineapple plantation and development of a chicken farm, so that community members may have a sustainable source of revenue. During this monitoring period the project has also furthered its agroforestry

program through the establishment of 0.6 ha of sustainable pineapple and djengkol plantation.

There is also a history of illegal logging inside the Project area and extending into Tanjung Puting National Park, and evidence has surfaced that some illegal logging activities may be ongoing in the southern portion of the project area. While this may or may not be directly related to project stakeholders, it has been necessary to confront the issue and provide alternative choices for those partaking, or at the very least, try to offset the forest loss itself. If the project were to crack down on illegal logging and not provide an alternative route, project stakeholders may experience the negative impacts of revenue loss or loss of firewood needed for cooking.

As such, the project has planted nearly 180,000 seedlings from 20 different species within the project buffer area during this monitoring period. Seedlings were purchased from village nurseries that are supported by individuals and families who provide the labor to grow the seedlings.

The project has also worked to prevent forest loss by oil palm expansion through stakeholder-engaged management of communal forest areas. This has been structured in a fashion to promote chances for long-term sustainability of forest areas and of timber supply. In doing so, the project has planted approximately 139,467 seedlings of 15 different species among 112 ha of forest and 564 ha of peatland.

If project activities are successful in protecting these forests and eliminating the threat of illegal logging, then individuals who rely on this practice for their livelihoods will see their benefits reduced. However, available information indicates that most if not all large-scale illegal logging is undertaken by communities from outside the Project zone, and that they have no traditional or communal claims to the land. The loss of benefits derived from such illegal activities is outside the scope of project requirements as defined by the CCB standard. For those project stakeholders who partake in illegal forest harvesting and who may be negatively impacted by the presence of the project, the project activities, such as those listed above, have been aimed at mitigating these impacts and providing alternative livelihoods that are safer and more sustainable.

Employment

In Kalimantan, a standard palm oil plantation employs one person per every eight hectares of land. The communities within Rimba Raya comprise roughly 2,000 families. Given the size of Rimba Raya, the number of workers required to work on palm concessions would comfortably exceed the supply of labor provided by Project zone communities. To compensate for the shortfall, the majority of laborers who would work in palm would be, and often have been in the past, hired from other parts of Indonesia (primarily Java). It has been common for palm companies to hire laborers from outside of local communities. There have been two reasons for this: migrant laborers are less concerned with protecting local forests; and as migrant laborers become economically dependent on palm, they tend to be more loyal to the company. Palm companies' preference for hiring outside labor thereby has limited opportunities for project zone communities to benefit from palm employment. The opportunity costs associated with palm employment have thus far not hard a large impact on project zone communities.

If the project successfully prevents oil palm companies from operating in the project area, some people who might have been employed by these companies may not have access to employment in the region. The overwhelming trend in standard employment practices of local palm oil companies is to hire trans-migrant labor from offsite locations such as Java and Sumatra. Therefore, in practice, very few of these employees would have been hired from inside project zone communities and those that would be employed would most likely be hired on an "as needed" seasonal basis. During interviews with the local communities, project proponents, World Education and OFI, all independently found that only a handful of community members were employed by the large palm oil operator on the northern border of Rimba Raya.

In addition to the positive externalities generated by implementing UN Millennium Goals, the foundation has created direct employment in fire prevention, forest security, and Orangutan care. Increased access to education, healthcare and microfinance has also helped to positively affect communities and mitigate any potential negative impacts.

To a large extent, the offsite stakeholders impacted by the loss of oil palm employment have been impossible to identify as they are brought in for temporary work as needed. With current plans on the part of the national and provincial government to expand palm oil plantations throughout Indonesia, this speculative group of negatively impacted stakeholders should have ample employment opportunities in other oil palm plantations.

As a matter of policy, members of project zone communities have been given priority in hiring for most project-related positions. To the extent that positions are not filled internally, however, they have been offered at large. Offsite stakeholders who have been negatively impacted by the loss of oil palm employment opportunities may apply as well.

Finally, for those people who have been working in the active plantation to the north of the project area and who may be negatively impacted by the project's plans to prevent further expansion of that plantation into the Project area (expansion that is currently illegal by the terms of the plantation's license), the project intends, via leakage mitigation contracts, to undertake a cooperative forest rehabilitation program that would offer these stakeholders additional employment opportunities. To date the Project has directly employed 73 community members as permanent full time staff.

4.2.2 Net Impacts on Other Stakeholders (CM2.3)

Despite the recognition of potential negative effects on stakeholders, Indicators and monitoring results with respect to the effectiveness of community-related activities were deemed to have an overall positive effect. Results were based on the activities, outputs, outcomes and impacts for each community-related project activity area. These can be reviewed more clearly in the Theory of Change tables located above in section , table 22.

All off-site stakeholders negatively impacted by project activities have been found to either belong to an inchoate group (displaced oil palm plantations) or have been engaged in illegal activities (logging operations). Conversely, project activities have been shown to result in substantial positive off-site impacts both from maintenance and improvements in ecosystem services and

from secondary and indirect effects of social and economic programs undertaken by project proponents.

Ultimately, estimating net impacts on off-site stakeholders is too speculative to be of much use, although it should be noted that the total potential off-site impacts are minor in comparison to the significant and overwhelmingly positive on-site stakeholder impacts of proposed project activities

4.3 Community Impact Monitoring

4.3.1 Community Monitoring Plan Development (CM3.3)

The Rimba Raya project is committed to the development of sustainable livelihoods for communities in the project zone. Monitoring activities used to measure the project's impact on community livelihoods have been designed to suit specific goals and interventions. Both a sustainable livelihoods framework (based on Bebbington 1999) and a Theory of Change framework was used to guide this process. The sustainable livelihoods framework is based on the premise that user groups and individual households have five capital assets, which they can use for various livelihood outcomes. These five capital assets include:

1. Physical capital (e.g., household assets, agricultural implements, transport, energy, communication and other infrastructure, technology).

2. Financial capital (e.g., credit, savings, remittances, pensions).

3. Social capital (e.g. adherence to rules, relationships of trust, mutuality of interest, leadership, kin and ethnic networks, social networks or organizations, access to wider institutions, ability to demand).

4. Natural capital (e.g. soil fertility, water resources, forest resources, grazing resources, land quantity and quality)

5. Human capital (e.g. knowledge and information, skills, health, ability to work).

All five of these capital assets are closely linked to each other and important to the development of sustainable community livelihoods. In the table below, the capital assets approach is used to frame principles, criterion, and indicators that may be appropriate for the Rimba Raya project zone. The listed criteria and indicators were chosen based on community livelihood needs identified during the preliminary social survey. Specific interventions were initially chosen with reference to the UN Millennium Development Goals, and adjusted to meet local needs in a participatory fashion, with target communities helping to identify the appropriate principles, criteria, interventions, and indicators for their area. Also note that criteria can be developed for various scales (e.g., household, village, and district levels). The examples below focus on the household and village level.

Monitoring Component		Activity
Initial Community Monitoring Component	Physical	Number of households that have upgraded from leaf to aluminum roofs.
		Number of individuals with fishing boats or other fishing equipment.
	Financial	Income and expenditures of families (e.g., proportion of households with income higher than the current level of income).
		Employment rates (e.g., number of family members with a job or business; distribution of job opportunities across gender and social status).
	Social	Number of households with members involved in at least one community organization or program.
		Proportion of families who participate in the formal electoral process (Number of households with actual voters).
		Number of grievances recorded against oil palm companies declines.
		Level of adherence to laws and frequency of penalties being given for those breaking them.
	Natural	Assess any decrease in flooding of their agricultural land and/or an increase in productivity of arable land.
		Assess that forests and agricultural areas that are important to meeting basic needs have become available.
		Assess water quality for turbidity and pollution and that draining of peat swamps in the area has stopped.
	Human	Check improvement in proportion of households or individuals with knowledge and information on hygiene
		Check number of incidence of diarrhea, typhoid

Monitoring Component		Activity
		Check proportion of households with sanitary toilet facilities (not excreting into the Seruyan River where they wash dishes and bathe)
		Check for improved sanitation facilities (hand washing soap, safe water containers, water treatment)
		Check percentage of households with access to clean water
		Check number of water treatment facilities in a village
		Check mortality rates (infant, child, mother)
		Existence of medical centers (including number of doctors and nurses and number of patient visits)
		Check prevalence of acute and chronic malnutrition and disease
		Check number of children attending school
		Check percent of family members who go/have gone to school
		Check number of family members who are able to read and write
		Check number of family members who have attended some type of livelihood related training
Comprehensive Community Monitoring Component	Preliminary High Conservation Monitoring Plan	Mapping of HCV5(basic needs) and HCV6 (Cultural Identity) areas
	Community Needs assessment	In depth community needs assessment in each village prior to any on the ground project implementation in coordination with World Education. To identify gaps between community needs and desired conditions with regard to all five capital assets as shown above.

Monitoring Component		Activity
	LARASITA	Work together with the local BPN office (Badan Pertanahan Nasional) through its LARASITA Program to establish formal land ownership for communities. Check formal landowner ship has been established
	Illegal logging	Mapping of real actors of illegal logging
	Job Opportunities with the Rimba Raya Project	Develop a strategy to provide training and other educational programs with the goal of increasing local capacity to fill more skilled and permanent positions within the project organization. Check local capacity has increased within the project organization.

Table 27. Parameters for the Rimba Raya Community Monitoring Plan

The Theory of Change framework for monitoring overlaps significantly with the framework described above, however, the TOC framework helps to provide more direct links between monitoring indicators and long-term project impacts. A detailed TOC analysis was conducted and relevant project activity outputs/monitoring indicators were identified. See TOC activity matrix for the full TOC analysis, and RP4 TOC Outputs Table v1.1.xlsx for monitoring results.

Community Needs Assessment

An in-depth community needs assessment will be carried out for each community in the Project zone prior to any on-the-ground project implementation. Such an assessment is important for identifying gaps between community needs and desired conditions with regard to all five capital assets (as described in Section CM3.1 above) – the foundation for creating sustainable livelihoods. This information will feed into all elements of project development, and will particularly guide the design of suitable community development programs. Importantly, it will also initiate relationship-building, crucial to project success. Engaging communities early in the project, with a focus on their needs, is also an important way to build a sense of belonging to the project. It must be noted that this can also be one of the riskiest stages in project development as it is often the stage where communities' hopes are raised and expectations can soar. Communities will be hoping for programs that offer immediate tangible benefits (jobs, healthcare, and other income-related activities). If such hopes are unwittingly created during this initial engagement, and subsequently unmet, conflict will likely arise, risking project success. It is critical that this assessment is undertaken in a manner that manages this risk. To avoid these risks, this assessment will be undertaken in cooperation with World Education, which has active programs and a productive working relationship in three Project zone villages (Baung, Ulak Batu and Palingkau).

LARASITA

Project proponents will work together with the local BPN office (Badan Pertanahan Nasional) through its LARASITA Program (Program Layanan Rakyat untuk Sertifikat Tanah; Public Service for Land Certification) to establish formal land ownership for communities. This will be a major step towards resolving current land tenure issues and safeguarding against future ones. Involvement in this program will be done in parallel with the participatory mapping of community land and resources. To date, the land conflicts that have occurred in villages in the Project area – especially between villagers and oil palm companies – have been a result of an uncoordinated licensing system by the Seruyan District. It is common practice that a license is issued by the District Head (Bupati) without taking into account other stakeholders' concerns – especially that of villagers or communities, which do not have the legal documentation to support the claim that their land has been unfairly taken by the licensed company

Job Opportunities with the Rimba Raya Project

Conflict between projects and local communities often occur when projects hire non-locals for all skilled and senior positions, offering only unskilled jobs to local community members (e.g., casual work during planting or harvesting seasons in oil palm plantations). The Rimba Raya project will invest in a strong strategy to provide training and other educational programs with the goal of

increasing local capacity to fill more skilled and permanent positions within the project organization. The Phase II Community Assessment will seek to identify appropriate positions and individuals from within Project zone communities.

Illegal logging

Illegal logging appears to be an on-going threat to forests and biodiversity in the Project area. Mapping the real actors involved in this illegal activity will be the first step in preparing strategies to resolve the issue. Given that a number of village heads in the Project zone were recently arrested for their involvement in illegal logging, it will be important to gain a clear picture of these individuals, their involvement, and their level of influence over community members.

4.3.2 Community Monitoring Plan Results (CM3.1, CM3.2, GL2.5)

The Results of community monitoring are shown in the tables below, and are also summarized in Table 22 above. Table 29 directly relates to monitoring results for poorer and more marginalized groups identified in section 4.4. The TOC analysis was also used to identify new monitoring indicators that are specified in RP4 TOC Outputs Table v1.1.xlsx.

	Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
1	Employment opportunities through construction & operation of guard & fire towers	complete	Building a post guard in Natai Kopi area (Ulak Batu village) in North Unit. The consideration is that this area is often exposed with fire.	Sep-16	Oct-16		North Unit Manager
		complete	Building a guard post in Sigintung area (Muara Dua village) in Central Unit as a one of collaboration action with Tanjung Putting National Park.	May-16	May-16	Determination criteria is based on fire vulnerability level, surveys to find best location were performed by Rimba Raya and Tanjung Puting National Park staff.	Central Unit Manager
		In progress	Building a guard post in Kudung area - South Unit	May-16	Ongoing	Hire a local residential to develop the guard post in Kudung.	South Unit Manager
		In progress	4 units of hydrant well have been made from 20 unit hydrant well targeted.	Mar-16	Ongoing	Pre-construction training for Rimba Raya field staff and Tanjung Puting National Park staff	Climate & GIS -Technical Staff (Coordinator)

2	Employment opportunities through Orangutan Care Facilities	in progress	Developing Rimba Raya Release Camp	Sep-16	Ongoing	Location determination is based on Satelite image, field survey, and depth analyzing, continue with physical construction:2 units of feeding platform dan flying camp for release.	OFI
3	Employment opportunities through Monitoring activities	complete	52 field staff and community staff from 14 villages	2013	2016	Open vacancy was made for every community members	GM
4	Employment of women in project related employment	complete	8 staff from the villages, 3 Sampit staff and 7 Jkt staff, plus more than 22 women are involved in productive activities in village work goup (Chicken meat, chicken egg, Handicraft, and Zuper work group)	2013	2016		HRD Director, GM and Unit Manager
5	Supply of fuel-efficient, low emissions, biomass cook stoves	complete	Distribute 1872 water filter for 9 villages for clean and drinkable water + 99 units of biomass cooked stove for the pilot project	year 2013	Sep-16	Identify villages where there is no clean water provided/access and villages who use traditional cook stove - wood fuel	Concession Manager and Unit Manager
6	Supply of Solar Lighting	complete	Distribute 1.671 solar lantern, 11 units of solar panel 60 watt, 11 units of solar generator 1 kw	Feb-16	Mar-16	Identify villages with no state electricity access	Concession Manager and Unit Manager
7	Community based agro-forestry	in progress	Developing Agro-forestry program in Natai Kopi area - Ulak Batu village: pineapple and djengkol for 0.6 Ha.	Jan-16	Ongoing	Perform participatory mapping for traditional land use and conduct survey to find out land potency	Concession Manager and Unit Manager

8	Build community centers in strategically selected villages inside the Project zone.	on progress	Developing village library as one of activity centers: Ulak Batu and Muara Dua village	Jan-17	Dec-18	The development of "PEDAL" program concept	Stakeholder Communication Technical Staff
9	Extend World Education's ongoing programs for food security, access to government services, and capacity building within the project zone	complete	Developing a work group for salty fish	Jan-17	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
10	Micro Credit will be provided. Project proponents will partner with certain organizations to provide: 1) funding for all individuals in the Rimba Raya Project zone; 2) budget support for field agents to work in the area; 3) supplementary budget support as needed and justified; and 4) support for training of field agents dedicated to the region.	In progress	Developing Shrimp paste work group Zuper	Oct-14	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
		in progress	Provide financial support for Chicken meat and chicken egg work groups, plus local cooperative Itah development	Aug-16	ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager

11	Sustainable Health Care. Program. IE plans to develop a health care system designed specifically to meet the needs of Project zone communities in collaboration with Health in Harmony (HIH), The IE health care program framework will comprise three steps: 1. Assess the health care needs of Project zone communities; 2. Develop a system that best suits their unique needs; and 3. Evaluate the program regularly to improve, adapt, and evolve as we learn more and needs change.	in progress	Distribute water Filter to 9 villages and install clean water system in Baung village	Apr-16	Sep-16	Identify the community members needs for health care and other issues related to health condition in the villages, including asses the needs of clean water	Comdev Technical Staff
		in progress	Develop a health care concept by "Floating Clinic"	Sep-16	Ongoing	Developed a healthy care concept "Floating Clinic" by identifying the health care system from the local government in order to provide a better health care for the local communities from 14 villages.	Comdev Technical Staff

Table 28. Summary of monitoring results from community activities.

Project Activity	Output (from this monitoring period)	Outcome (from this monitoring period)	Impact
Employment opportunities through Monitoring activities	3 completed guard posts built, one each in the North, Central, and South Unit 1 fire tower is being planned	Increased employment of community members. Increased number of community members with alternative revenue streams. Completed three additional guard posts.	Eradicate extreme poverty and hunger
Community based agro-forestry	0.6 ha of pineapple and djemgkol growth	Development of community based food sources	

Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of community members with access to clean water. Decreased number of community members becoming ill due to water-borne and sanitation-related illnesses	
Fisheries: same as for water above, plus planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	Development of 1 floating cage system and 10 fish ponds that are 6 m^2 each. 10,000 juvenile catfish were introduced.	Development of community based food sources	
Micro Credit Program	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of community members (notably women) pursuing independent, sustainable sources of income based off of learning new	

		skills/knowledge. Increase in independent food production	
Supply of Solar Lighting	Distribution of 1,671 solar lantern, 11 units of 60 watt solar panels, 11 units of 1 kw solar generator	More households with access to light and electricity. Increased number of people that can read/study at night	Achieve universal primary education
Build community centers in strategically selected villages inside the Project zone.	Creation of 1 library inside 1 community center	Provision of a central community space and building for educational activities to occur/educational resources to exist. Increased number of people with access to educational spaces/educational material	
Extend World Education's ongoing programs for food security, access to government services, and capacity building within the project zone	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of community members (notably women) gaining skills and education from capacity building	

Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of community members with clean water awareness and gained knowledge about safe drinking habits and sanitation	
Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns	15,310 hectares of forest continued to be protected within the 47,237 hectare project area	Increased awareness of the importance of forest protection and forest health	
Employment of women in project related employment	18 women hired for project activities 22 women involved in micro-credit program	Increased number of women that are financially self-sufficient	Promote gender equality and empower women

Fisheries: planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	Development of 1 floating cage system and 10 fish ponds that are 6 m^2 each. 10,000 juvenile catfish were introduced.	Increased number of women that are financially self-sufficient	
Micro Credit Programs	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of women pursuing independent, sustainable sources of income	
Women Capacity Building (peningkatan kapasitas perempuan)	Development of 4 working groups – salt fish, shrimp paste, recycled souvenirs, chicken egg and meat production	Increased number of women pursuing independent, sustainable sources of income	
Supply of fuel-efficient, low emissions, biomass cook stoves	99 fuel-efficient cook stoves distributed	Decrease in number of children sick/dying due to indoor air quality issues	Reduce child mortality
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Decrease in number of children sick/dying from unclean water and issues related to open defecation/sanitation related	

zones.		sicknesses	
Supply of fuel-efficient, low emissions, biomass cook stoves	99 fuel-efficient cook stoves distributed	Decrease in number of mothers/infants sick/dying due to indoor air quality	Improve maternal health
Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	Distribution of 1872 water filter for 9 villages for clean and drinkable water	Increased number of people with access to clean water. Decreased number of people becoming sick/dying due to water borne illnesses. Increased awareness about water borne diseases, sanitation, and transmission of diseases through mosquitoes	

Table 29. Monitoring outputs for activities that provide benefits to poor, marginalized, and vulnerable groups.

4.3.3 Dissemination of Monitoring Plan and Results (CM3.3)

Field monitoring occurs within each field unit on a minimum of a weekly basis, and in some locations where there is concern for, or a history of encroachment, it can be as frequently as daily. Monitoring trip reports are kept at the field unit level for each trip and compiled by field unit manager as a summary to be provided to the Sampit office on a monthly basis. APCS uses these reports along with work progress reports to provide a monthly report to InfiniteEARTH and RRC Jakarta office and to prepare the annual period monitoring plan. The reports are available by anyone upon request and actively disseminated to all stakeholders on an annual basis prior to any upcoming audit. Summaries of monitoring results are disseminated within communities using the community information boards.

4.4 Optional Criterion: Exceptional Community Benefits

The Rimba Raya project is applying for Gold Level verification status under the CCB standard on the basis of the exceptional community benefits described below.

Human Development Ranking

Indonesia is a Medium Human Development country on the UNDP Human Development Index (UNDP 2007). Poverty level of the administrative area of the project, therefore, is used to qualify for Criterion GL2.1. The Rimba Raya Project is located in the Seruyan District (Kabupaten) of Central Kalimantan. At least 50% of the population of the Seruyan District is below the national poverty line.

In 2015, the Seruyan District was designated as the underdeveloped district for the years 2015-2019 (Adriannoor, 2016). This means that based on the economy, human resources, infrastructure, financial ability, and accessibility, this district remains in need of additional development support. One noted area of special concern has been the lack of infrastructure within the district, which raises the transaction costs of development much higher. Basic social services are extremely limited. Social service disparity extends to access to electricity, quality education, public health facilities, clean drinking water, and sanitation systems.

Despite differing thresholds for the national poverty line, the Seruyan District exceeds all on a per capita basis. The national poverty line in Indonesia, set by the Indonesian Bureau of Statistics (Badan Pusat Statistic – BPS), is defined by household ability to afford a specified minimum food intake and other essential non-food items. The Indonesian poverty line is lower than that commonly used by international organizations, such as the World Bank and UN. In 2015, the World Bank updated the International Poverty Line to $1.90/day. In contrast, the national poverty line in Indonesia in 2017 was set at IDR 385,621/month (approximately $0.9 USD/day) for urban areas and IDR 361,469/month (approximately $0.88 USD/day) for rural areas (BPS 2017). This nearly 100% difference of almost $1 USD/day between international and national standards has a profound impact on poverty statistics – tens of millions of Indonesian households meet World Bank and UN definitions of poverty.

The national government sets the specific poverty level for each region and for Central

Kalimantan; the poverty level was set at IDR 414,002 per month (approximately $1.01 USD/day) for rural areas[15] (BPS 2017). National census data are not available for 2017. However, in 2017 the project proponent conducted a survey of 239 respondents that live within 8 villages inside the project zone, inside the Seruyan District. These data show that the average household income is IDR 1.65 million/month (approximately $4.06 USD/day) and average household size (including head of household) is 4.95 persons. This equates to a per capita income of 333,333/month (approximately $0.82 USD/day) which is well below the national poverty line, the poverty line for Central Kalimantan and the World Bank International Poverty Line.

The most recent census data for Seruyan District is from 2008 and can be seen in the table below (Table 30). This data indicates that the average household income in the Project zone for 2008-2009 was 500,000 Indonesian rupiah or USD$58.50/month (using a historic exchange rate IDR 0.000091/USD). Of a total population of 11,343 in 2,886 households this equates to approximately 3.9 people per household, resulting in a meager monthly per capita income of IDR 128,556 (or $0.38person/day). In 2008 the poverty line was set at IDR 178,657/person/month ($0.53 USD/day) (Indonesian Bureau of Statistics, 2008). This means the average person in the Seruyan District was earning around IDR 50,000/month under the poverty line.

Village	Number of Households	Total Household Inhabitants	Average Household Size	Average Monthly Household Income (IDR)	Monthly per Capita Income (IDR)	Daily per Capita Income (USD/Day)
Bahaur	147	1350	9.2	500,000	54,444	$0.21
Paring Raya	151	651	4.3	500,000	115,975	$0.45
Parang Batang	197	1029	5.2	500,000	95,724	$0.37
Tanjung Hanau	119	478	4.0	500,000	124,477	$0.48
Banua Usang	372	990	2.7	500,000	187,879	$0.72
Paren	117	376	3.2	400,000	124,468	$0.48

[15] https://www.bps.go.id/linkTableDinamis/view/id/1120

Ulak Batu	54	285	5.3	400,000	75,789	$0.29
Palingkau	49	171	3.5	400,000	114,620	$0.44
Cempaka Baru	133	613	4.6	500,000	108,483	$0.42
Telaga Pulang	421	1.484	3.5	800,000	226,954	$0.87
Baung	171	690	4.0	500,000	123,913	$0.48
Jahitan	143	482	3.4	500,000	148,340	$0.57
Muara Dua	169	557	3.3	500,000	151,706	$0.58
Tanjung Rangas	643	2187	3.4	500,000	147,005	$0.57
Total:	**2886**	**11,343**	**3.9**	**500,000**	**128,556**	**$0.49**

Table 30. **Demographic & Economic Data for Local Communities within the Project Management Zone.** **Compiled from the Central Bureau of Statistics of the Seruyan District.*

Additional standard indicators of poverty include access to education, health care, clean drinking water and housing. As detailed above in the community section, access to all four of these services are extremely limited and/or non-existent in the project area. Both health care and education facilities require distant travel and cost is a limiting factor. Sanitation facilities are not available (e.g. septic tanks are not used), with toilets designed to drop waste directly into rivers – the same rivers used to bathe, wash and collect water for drinking and cooking. Supporting data for these conditions are based on direct observations acquired during a recent social survey, site visits and from other national and international organizations working in the area (OFI and World Education). Limited available government data are consistent with this conclusion.

A government health program called Jaminan Kesehatan Masyarakat (Jamkesmas) assists poor families with the cost of health care announced last year that 27,143 residents out of the c. 112,000 of the Seruyan District (c. 24%) were too poor to cover their own medical costs, thus qualifying for this program (Kapuas 2008). Again, this averages across the entire Seruyan District, not specifically for the communities or sub-districts in the project zone, which by anecdotal data are amongst the most impoverished people in the Seruyan district. When widely

recognized severe disparities of income between urban and rural populations are considered, the extreme rural conditions of the Project area would suggest that far more than 24% of the population cannot afford access to basic medical care.

Although Indonesia is the largest economy in Southeast Asia and has made considerable advances in recent years in reducing poverty among its inhabitants, it is still a middle-income[16] country where many inhabitants, especially those in rural areas are directly affected by poverty. The location of the project, in the rural Seruyan District of the province of Central Kalimantan, has been identified as one of the poorest [17]districts in Indonesia. This data demonstrates that the project fulfills the community gold level requirement that the project must exist in an administrative area in a medium or high human development country in which at least 50% of the population of the area is below the national poverty line.

4.4.1 Barriers to Benefits (GL2.3)

The two greatest barriers, or risks, that may prevent project benefits reaching the poorer households include: 1) Communication on program opportunities being restricted, intentionally or unintentionally, from reaching the poorer households. For example, the village head (who is usually relatively affluent in a community and frequently used as the sole conduit for distributing information) may try to guide or restrict program participation based on their personal interests and family or other personal relationships. 2) The communities being provoked by a project opponent and misguided to categorically reject the project. In this scenario, communities in the area are erroneously seen as accepting of every development project or program offered to them, when in fact, they may wish to filter out questionable initiatives. If the Project does not provide a mechanism for communities to provide such feedback, this renders communities vulnerable to provocation by individuals with alternative agendas threatened by the Project.

The project explicitly addresses these barriers as an objective of the project (see Section 2.1.1): to engage with 25% of the poorest people in each community to identify the presence of these barriers and to overcome these risks. A special supplemental survey was conducted in 2017 to assess the presence of these barriers and risks in a differentiated approach.

These barriers and risks are mitigated through direct communication with the target households, and by taking advantage of, but not relying exclusively on, traditional forms of communication. Communication with communities has therefore followed two paths: the traditional system via local government (sub-District, township and village heads) and a direct grassroots system, delivering project information directly through physical site visits. This approach aims to appease local government and traditional leaders, not overstepping or offending them, but has also ensured that communication with the poorest households has been fluid and has maximized their participation in project activities.

[16] See 2017 Audit\CCB Monitoring\Indonesia Overview - World Bank Group.pdf
[17] See Jokowi Tetapkan 122 Kabupaten ini Daerah Tertinggal 2015-2019.pdf

4.4.2 Protections for Poorer and More Vulnerable Households and Individuals (GL2.4)

This section describes how the project has identified households in the lowest category of well-being and how these households have specifically benefited from the Project.

The project explicitly addresses protection for poorer and move vulnerable households and individuals as an objective of the project (see Section 2.1.1): to avoid or mitigate negative impacts in ache community including the poor, vulnerable, marginal and women. Multiple surveys were conducted and a detailed Theory of Change model (see Section 4.1.1) was developed to study the impacts of the Project on the poor, vulnerable, and marginal groups as well as women.

Households in the lowest category of well-being were identified through a comprehensive household livelihood security assessment (HLSA) or similar tool. This assessment incorporated all elements that contribute to a household's well-being, and analyzed whether households had adequate and sustainable access to income and resources to meet basic needs, such as access to food, drinking water, health facilities, educational opportunities, housing, and time for community participation and social integration (CARE 2002). A special supplemental survey was conducted in 2017 to assess the presence of these barriers and risks in a differentiated approach. A special supplemental survey was also conducted in 2017 to specifically assess the presence of positive and negative impacts on poor and vulnerable groups including women.

The population of the Project area is approximately 15,826 individuals from 2,886 households. Fifty percent of the poorest quartile amounts to 1,978 individuals, or c. 361 households, that have benefited substantially from the Project in order to meet community gold level criterion.

The Project has been designed such that it offers a multitude of programs and activities to communities across the Project area. During this monitoring period, this has included construction of a library in one of the community centers, development and implementation of a micro-credit program, construction of a mobile health clinic, reforestation in three locations spread across the Project zone, development of pineapple and djengkol agroforestry sites, construction of an orangutan release site (employment) as well as distribution of water filters and clean water systems to 9 villages. These programs and activities are designed and implemented to target and prioritize involvement of individuals in the poorest quartile of households; however they have reached far more than 50% (361 household) of the poorest quartile.

The poorest quartile has benefited substantially by gaining access to resources previously unavailable to them; clean water, health care, education, training, credit and employment opportunities. Their involvement in any of the programs and use of any of the services has been optional, but participation has been high and is expected to grow based on community consultation and feedback from local and international NGOs working in the area. Individuals in this quartile are offered services and opportunities that improve quality of life for their families, empowering them and lifting them from chronic poverty.

Economic Impact of Project Activities on Local Communities

Quantifiable economic impacts to the communities are difficult to support and at this early stage are necessarily descriptive. However, the project's projected budget has closely approximated the entire aggregate household income of the communities prior to project commencement and now after the project has been in effect for several years (see Table 30). Additionally, project activities such as reforestation / agro-forestry and aquaponics programs have replaced income from unsustainable practices. These new income sources have provided income growth and have mitigated environmental pressures.

Project activities have been heavily focused on maintaining and enhancing forests and natural ecosystems, and thus the environmental, socio-economic, and cultural benefits derived from them. These collateral benefits, such as access to health services, clean water, early childhood development, and micro-credit, have substantially increased the standard of living and quality of life indexes for these communities. Proponents believe therefore, that it is fair to conclude that the project has had an overwhelmingly positive and quantitative impact on all communities bordering the project zone.

The table below summarizes project activities specifically designed to target exceptional community benefits and the progress that has been made during this monitoring period. None of the planned project activities have had a negative impact on HCVs in the Project zone.

	Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
1	Prevent further oil palm expansion; maintain and enhance remaining forests in the Project zone; possibly rehabilitate select riparian forest zones; prevent spread of forest fires, specially into peat areas with direct impact on water quality of the Seruyan	on progress	No further encroachment for palm oil by PT BEST	Jan-15	Ongoing	Rimba Raya keeps conducting routine patrols to monitor and protect the prior encroachment area, and increase the patrols to several high risks/vulnerable area from encroachment, illegal logging and fire.	GM and CM
2	Protect all remaining forests (esp. natural forests) and wetlands from periodic fire; prevent further conversion to industrial scale agriculture, which increases fire risk; reduce possible deliberate use of fire for renewal of shallow water fishing grounds through education and awareness campaigns	on progress	The project acknowledges that preventing fire is challenging, and has subsequently identified the location of posts and engagement and training of fire guards is urgent.	Jan-15	Ongoing	The project will continue to patrol and protect the boundaries and plans to increase the intensity particularly in the high risk areas.	GM and CM
3	Water: Prevention of further oil palm expansion; education and outreach to create viable safer alternative for public sanitation; prevention of further conversion and loss of riparian forests, as well as possible rehabilitation of key riparian zones.	on progress	Water quality has been maintained through prevention of further oil palm conversion and rehabilitation of disturbed areas in particular in the northern boundary.	Jan-15	Ongoing	Build a guard post in Natai kopi - Ulak Batu village and perform routine patroli	South Unit Manager

4	Fisheries: same as for water above, plus planned efforts to explore potential for facilitating communities to organize and establish a fisheries cooperative, local rules and management regulations, and associated local enforcement bodies.	on progress	Developing fish work group by floating cage system in Seruyan river and fish pond system cultivation	Mar-17	Ongoing	Identify fish potency in Tanjung Rangas village and develop fish cultivation work group	Comdev Technical Staff
		on progress	Determining the fish size to develop salty fish program in Muara Dua village - Tampudau in order to provide sustainable production	Jan-17	Ongoing	Identify fish potency, including catching method, development of fish work group (after harvest period), arrange regulations/fish size for salty fish program	Comdev Technical Staff
5	Building materials: Prevention of forest loss by oil palm expansion and possible development of local bodies to manage local timber harvesting levels to promote chances for long-term sustainable supplies.	on progress	Perform replanting program for 15 types of forest trees for 80.000 seedlings in 112 Ha - mineral soil (Natai) and 564 in peat area	Jan-15	Ongoing	Identify replanting location, replanting/land model development, develop 2 nurseries in Ulak batu and Desa Muara Dua village, provide pulled-out seedlings form the forest	Biodiversity Technical Staff
6	Fuel wood: prevention of large-scale natural vegetation clearance for oil palm.	complete	Distribute water filter for 9 villages; clean drinkable water without cooking	Apr-16	Sep-16	Identify villages where there is no clean water provided/access and villages that use traditional cook stove - wood fuel. The biomass cook stove distribution was a pilot project to get feedback from the community and to find out their preference on stove type	Concession Manager and Unit Manager
		complete	Distribute 99 Friendly cook stove as pilot project	year 2013			
7	Prevention of forest loss by oil palm expansion and possible development of local bodies to manage communal forest areas in a more structured fashion to promote chances for long-term sustainability of forest areas	on progress	Develop village agreement and participatory mapping for traditional land use, and assist the village government in arranging the village development - medium term	Jan-15	Ongoing	Workshop in village level for village agreement and participatory mapping programs	Comdev Technical Staff

8	Buffer Planting Program	complete	179.145 Seedlings (more than 20 species) being planted within the concession and seedlings were purchased from village nurseries that are supported by individuals and families who provide the labor to grow the seedlings. This purchase price is developed from the effort and seedlings grown by individuals and families.	Jan-15	Feb-17	Identify replanting location, replanting/land model development, develop 2 nurseries in Ulak batu and Desa Muara Dua village, provide pulled-out seedlings form the forest	Biodiversity Technical Staff and Unit Manager
9	Women Capacity Building *(peningkatan kapasitas perempuan)*	on progress	Pengembangan Kelompok Terasi Zuper,	Oct-14	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
		on progress	Develop handicraft work group in Telaga Pulang village - a women group who create souvenirs from reused garbage.	2014	Ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager
		on progress	Provide financial support for Chicken meat and chicken egg work groups, plus local cooperative Itah development	Aug-16	ongoing	Identify the economy potency, perform work group accompaniment, and develop training to increase the skills for specific program.	Comdev Technical Staff and Unit Manager

Table 31. Summary of Project Activities and their Resulting Exceptional Community Benefits

Identification and mitigation of negative impacts from project to poorer households

Measures to identify the most vulnerable households and individuals were undertaken as part of the survey described above. Part of this assessment has been to identify ways in which all households, including the poorest households, have been or may have been negatively affected by the project.

In the past, livelihoods in the Project area are largely dependent on fishing and a limited amount of farming (with productivity in apparent steep decline). Project activities have been designed to enhance these activities, in order to improve techniques and subsequent returns. Socially and politically, the project is thought to provide negligible risk to poor or vulnerable households. Although currently deemed unlikely, the risk of previously unidentified negative impacts arising is always present and continues to be monitored. The table below explores potential negative impacts made by the projects and methods that have been used to avert or mitigate these impacts. As is shown through the Theory of Change diagrams and models, the project has had net positive impacts on poorer and more vulnerable households within the project zone.

Potential negative impact	Households or individuals affected	Impact aversion and mitigation
Livelihood and social opportunities are lost	Vulnerable or marginalized groups who do not contribute to communal forest mapping/protection	Ensure vulnerable and marginalized groups provide input to participatory mapping activities and forest mapping/protection
Micro-credit support and funding is not available therefore livelihood and social opportunities are lost	Vulnerable or marginalized groups who do not access the micro-credit program or whose work would be in direct conflict/competition with work brought about by the micro-credit program	Ensure vulnerable or marginalized group have direct (and/or individualized) access to the micro-credit program. Ensure there are no conflicts between work of vulnerable or marginalized groups that is outside of micro-credit program

Table 32. Potential negative impacts and how they were averted or mitigated.

5 BIODIVERSITY

5.1 Net Positive Biodiversity Impacts

5.1.1 Biodiversity Changes (B1.1)

The net biodiversity benefits and impacts for the project zone during this monitoring period have been, and are expected to continue to be, positive. The goals for biodiversity impacts for the project include change in the number of hectares significantly better managed by the project for biodiversity conservation (as compared with the without-project scenario) and an increase in protection (via habitat preservation) for the globally Critically Endangered or Endangered species that benefit from reduced threats as a result of project activities (as measured against the without-project scenario).

The 'without project' scenario equates to conversion of most or all remaining forests in the project area to oil palm plantations, which is currently the greatest threat to biodiversity in the project zone. A sharp decline in the biodiversity of the project zone through direct negative impacts of land clearing and associated indirect impacts (e.g., providing access to more remote forests for hunting, illegal logging, increased fire risk, and the draining of peat swamp forest) would be the result. Such indirect impacts would also allow greater access to Tanjung Putting National Park which would result in a significant impact on the park's biodiversity and threaten the OFI Orangutan release program.

Since the project started, it has directly and indirectly contributed to net positive biodiversity impacts described above. Directly the project has provided financial support to OFI to continue with its work to rehabilitate and release orangutan back into the forest. The project has also built a release center in the project area and will continue to monitor and protect the boundaries of the project from the agents of deforestation and the impacts of fire. Indirectly the project has avoided the conversion of 44,263 hectares of peat swamp forest compared with the baseline scenario through implementation of a variety of project activities and monitoring efforts. This forest represents a significant habit that will be extremely important to the ongoing protection of the orangutans and other endangered species in the future.

Through the establishment of the Rimba Raya project, any negative biodiversity impacts have been avoided and the project activities implemented during this monitoring period have created positive biodiversity impacts.

5.1.2 High Conservation Value Protection (B1.2)

During this monitoring period, none of the planned project activities have shown a negative impact on HCVs in the project zone. Project activities have been heavily focused on maintaining and enhancing forests and natural ecosystems, as well as the connectivity among them. Such activities have shown a strong positive impact on HCVs 1-3.

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 previous study of the project 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 zone.

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), bearded pig (Sus barbatus), endangered Borneo Bay cat (Catopuma badia), and hairy-nosed otter (Lutra sumatrana). An estimated 45 species of bats 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.

Table 33 below summarizes the most severe threats for HCVs 1-3 in the Project zone and provides associated management recommendations and activities to alleviate these threats. This highlights the project focus on maintaining and enhancing forests and natural ecosystems to protect HCVs 1-3. Threats and project activities to mitigate key threats are discussed further below.A total of 54 species listed as *Critically Endangered* or *Endangered* by IUCN are likely present in the Rimba Raya Project area, 8 of which have been confirmed present in TPNP during the 2014-2017 monitoring period.. An additional 40 species listed as *Vulnerable* by IUCN are likely present in the Project area, 14 of which were confirmed in TNTP within the monitoring period. Conservation of the project area has protected these species.

Maintaining and enhancing forests and other natural ecosystems is essential to protecting HCVs 1-3 in the project zone. Some of these HCV sub-values have required protection of specific areas within the project zone (e.g. ecotones and areas that provide connectivity between the project area and neighboring Tanjung Puting National Park). Additionally, maintenance of some HCVs has required education programs for local communities.

HCV	Threats to HCV	Management Recommendation & Activities
1.1	Disconnecting HCV 1.1 forests from the Project area; degrading or removing forest or other natural habitat from the supporting area (Project zone)	Maintain and enhance forests in the Project zone and connectivity to the Project area because of its supporting function to neighboring TPNP
1.2	**Plants:** Illegal logging, fire, small scale agriculture, conversion to oil palm	**Plants:** Cessation of logging (except limited selective timber harvesting for local consumption); protection all remaining forests
	Herps (possibly one terrapin): hunting, egg harvesting, degradation of riparian habitats and sand beaches along river used for nesting	**Herps:** Protection of the Seruyan and its tributaries through stabilizing land use and potentially replanting some areas to restore riparian zone and flood plain buffers. Education program for local communities.
1.3	Habitat loss, habitat degradation, hunting	Protecting all remaining forests (esp. natural forests) and wetlands; prevent further conversion to industrial scale agriculture; reducing hunting through education and awareness campaigns
1.4	**Lakes & water bodies:** water pollution, human inhabitation, conversion of shores, hunting.	**Lakes & water bodies:** Education and protection of important bird areas
	Grassy banks & slow moving rivers: habitat conversion	**Grassy banks & slow moving rivers:** Education and protection of areas important to birds for nesting or foraging.
	Ecotones: Habitat disturbance, especially through land clearance	Ecotones: Protection of forest and wetland ecotones from any form of disturbance
2.1	HCV deemed not present because large tracts of forest already fragmented by anthropogenic causes (fire and logging)	Potential to enhance landscape level forest connectivity (in turn restoring this HCV) by preventing further isolation of remaining fragments and reconnecting large remnant patches of forest
2.2	Habitat degradation and conversion	Protecting wetlands and forests where ecotones exist
2.3	Habitat degradation and conversion; hunting	Protecting wetlands and forests; reduce hunting
3	Logging and forest conversion	Not to clear forest in HCV 3 areas

Table 33. Threats and management recommendations for HCVs 1-3 in the Project zone

HCV 1.1 Support Function to Protected Areas

HCV 1.1 draws attention to areas that contain or provide biodiversity support function to protection or conservation areas in or near the project zone to ensure that management actions are taken to maintain or enhance the function of such areas.

During this monitoring period, HCV 1.1 has been considered present in the project zone, given its condition (at least partially forested) and direct contiguity with the eastern boundary of TPNP, a protected area of very high biodiversity conservation importance. The project zone provides vital biodiversity support function as a buffer zone of TPNP, by expanding the effective area of lowland forest cover in the greater Tanjung Puting landscape by 14% (OFI 2008). This buffer zone function has expanded available habitat for orangutans and a wide variety of other threatened or protected plant and animal species in the national park.

The project zone also contains legally mandated protection zones along riparian-zone floodplains of the Seruyan River and its numerous tributaries, as well as lake shore buffer zones associated with undiscovered wetland areas potentially present within the freshwater/peat swamp mosaic of habitats in the project zone, and the western shores of the Sembuluh Lake system overlapping the eastern boundary of the project zone.

Key threats to this HCV include forest loss due to fire and oil palm conversion, degradation of the biodiversity value of the buffer through logging and degradation of riparian and lake side buffer zones through small-scale conversion for agriculture and development of human settlements in lakeside environments. All of the conservation efforts described in more detail below to maintain HCVs 1.3, 1.4, 2.2, and 2.3 ensure positive net impacts on HCV 1.1 by the project.

HCV 1.2 Critically Endangered Species

Conservation activities of the project have had net positive impacts on HCV 1.2 species as follows:

Birds and Mammals

No critically endangered birds or mammals have been confirmed inside of the project area during this monitoring period.

Plants.

Twenty-five HCV 1.2 plants were identified as likely present in the Rimba Raya project zone, with two species confirmed in the project zone within this monitoring period. These species occur in various forms (freshwater swamp forest, peat swamp forest and lowland dipterocarp forest) and all are considered CR due primarily to habitat loss. Proposed HCV 1.2 management has precisely addressed this threat, pursued in parallel with HCV 1.3 and 3 (see below), where the goal has been to maintain and manage sufficient habitat to ensure long-term population viability of all threatened, protected and restricted range species.

At present, insufficient data are available to estimate existing population sizes for HCV 1.2 plants in the project zone, or to determine minimum necessary population sizes to ensure long-term viability. However, as the project aims to retain all remnant natural forest, successful conservation measures taken by the project to protect natural forests have increased long-term population viability of these HCV 1.2 species.

It should also be noted that the HCV Toolkit for Indonesia makes provision for limited harvesting of CR plants of demonstrable economic importance – e.g., locally common dipterocarp species that contribute substantially to commercial timber volumes in a logging concession – provided that a management plan is in place to ensure long term population viability through sustainable harvesting. In this situation, management of commercial HCV 1.2 plants becomes identical to that of HCV 1.3, namely to retain sufficient habitat for maintaining viable populations. In the case of the Rimba Raya project, this management provision of HCV 1.2 would permit limited selective timber harvesting of CR dipterocarps for local use by communities within the project zone as part of a broader livelihoods development program.

Herptofauna.

Only one HCV 1.2 species of herptofauna was identified as potentially present in the project zone, the CR Painted river terrapin (*Callagur borneoensis*). This species is known to inhabit the tidal portions of rivers and estuarine mangrove areas and to feed on fruit, leaves, and clams, although its presence within the project zone has not been confirmed. As the project aims to prevent further degradation of the Seruyan River and its tributaries through stabilizing land use and replanting some areas to restore riparian zone and flood plain buffers, these successful conservation actions have had a positive net impact on this HCV 1.2 species, if present.

Conclusion.

Overall, conservation efforts made by the project to protect remaining natural forests and prevent further degradation of river quality have resulted in net positive impacts on HCV 1.2 species likely present in the Project zone.

HCV 1.3 Areas that Contain Habitat for Viable Populations of Endangered, Restricted-Range, or Protected Species

The aim of HCV 1.3 is to identify areas where viable populations of endangered, restricted-range, or protected species are known or likely to occur, and to ensure that management action is taken to conserve sufficient habitat for long-term viability of the population. In the assessment of this HCV, populations of species confirmed or likely present are assumed to be viable until credibly proven otherwise through population modeling, analysis of habitat extent and condition, or exhaustive field surveys. HCV 1.3 species also include viable populations of CR species listed above under HCV 1.2.

Conservation activities of the project have had net positive impacts on HCV 1.3 bird, mammal, or plant species as follows:

Birds.

A total of 110 HCV 1.3 bird species are considered likely present in the project zone. Of these, 38 (35%) are thought to depend solely on natural forest, while another 34 (31%) use natural forest as well as disturbed forests. Nineteen species are known to use converted non-forest lands, but only 3 of these exist solely in non-forested areas. Thirty-nine species are wetland and/or coastal species.

Major threats to HCV 1.3 birds include habitat loss and degradation, especially of riparian and wetland habitat for aquatic birds. As with other parts of Kalimantan, bird capture for local consumption and the commercial pet trade may represent a further threat to HCV 1.3 birds, but there were no indications of such activity during field visits to villages in the project zone.

Based on habitat needs for HCV 1.3 birds, long-term population viability has required protecting forests and non-forested wetlands. Project conservation measures to protect all remaining forests and to restore targeted riparian and floodplain buffer zones in the Project area have addressed the most important threat to HCV 1.3 species by securing remaining habitat and preventing further losses. Protection of non-forest wetland areas has also been required, but since the project aims to protect all remaining natural habitat, especially by preventing conversion to oil palm, wetland protection has also been achieved by the project.

Additional environmental outreach and education activities, planned as part of a broader livelihoods and community engagement program, have also served to reduce hunting and trapping pressures on bird populations, which as noted has already appeared to be low. Because these project activities have been successfully implemented, net project impacts on HCV 1.3 bird populations have been positive.

Mammals.

Fifty-five HCV 1.3 mammal species are potentially present in the Project zone. Of these, eight are listed by IUCN as Endangered and 21 as Vulnerable, a total of 24 species are protected by the Government of Indonesia, and 15 species are endemic to Borneo.

As with birds, many HCV 1.3 mammals are dependent on natural forest habitats. Thirty-four HCV 1.3 mammals in the Project zone are dependent on forest, and seven of these rely exclusively on primary forest. While the remaining 21 species use forest, they are also known to use non-forested areas (e.g. *ladang* agriculture, scrub, short secondary forest regrowth), usually when such areas are in close proximity to forests. Only the orangutan and pangolin have been known to enter and use gardens and plantations on a regular basis when food is available.

The major threat to HCV 1.3 mammals has been habitat loss and degradation, especially intact lowland dipterocarp and peat swamp habitats. As with other parts of Kalimantan, mammal capture for local consumption may be a further threat to HCV 1.3 mammals, but preliminary data collected during field visits to villages in the project zone have indicted a very low frequency of hunting, due in part to the fact that most communities are Muslim and therefore may consume a small number of mammal species. Project conservation measures to protect all remaining natural habitat and to restore targeted riparian and floodplain buffer zones in the project area have addressed the most important threat to HCV 1.3 mammals by securing remaining habitat and preventing further losses. Additional environmental outreach and education activities, planned as part of a broader livelihoods and community empowerment program, will serve to reduce potential hunting pressure further, which as noted already appears to be low. Together, these project activities will serve to maintain or enhance HCV 1.3 mammals.

Project benefits for orangutans deserve special mention. Much of the land in the project area remains undeveloped, providing an estimated 47,000 ha of additional land contiguous with TPNP to the west of the Project area (OFI 2008). This represents 14% of forest in the region of TPNP and adjacent areas, providing significant habitat for orangutans and other wildlife. A past study on orangutans in TPNP and its buffer, including portions of the Project area, found resident orangutan populations averaging 1.9 orangutans per square kilometer (Galdikas et al. unpublished report, cited in OFI 2008). More recent field surveys by OFI confirmed similar orangutan densities in the project area as a whole and showed that individual orangutan home ranges cross the park boundary into the Project area (Basic Information - Audit 2017 (poin5-BS)-Nandez_edited-ENG.doc). This demonstrates occurrence of one or more inter-connected orangutan population(s) in TPNP and the Project area.

The current orangutan population of TPNP is estimated to be between 4,180 (PHVA, 2016) and 6,839 individuals (TNTP, 2012). Adjacent forests in the Project area provide an additional 15,000 hectares of suitable orangutan habitat, supporting an estimated 760 individuals. This figure represents an augmentation of the TPNP orangutan population by an additional 14%.

The project has greatly reduced deforestation rates over the lifespan of the project, primarily by preventing oil palm plantation development in the park buffer and limiting access to the national park from the eastern border. These preventive measures will have marked impacts on the long-

term population status of the orangutan. A 2008 analysis of past and future projected deforestation in the project area found that forest in the Project area would be completely deforested in a 'without project' scenario and that TPNP would lose an estimated 147,237 hectares (60%) of its forest cover during this same period. By extrapolation, this simplified 'without project' scenario suggests that the orangutan population in the project area would be reduced by more than one-half and that of the greater TPNP orangutan population would be reduced by a third.

Plants. Twenty-four HCV 1.3 plant species were identified as confirmed or likely present in the project zone. Most common among these are members of the Dipterocarpaceae (18 of 24 species), including six species listed as Vulnerable by IUCN, 14 as Endangered IUCN, and six protected under Indonesian law. These species are concentrated mainly in peat and mixed freshwater swamp ecosystems of the project zone, but at least 14 species have also been likely to occur in the area of lowland dipterocarp forest in the north. All of these species, especially dipterocarps, are largely or totally dependent on natural forest for pollination by out breeding, seed predator avoidance, seedling recruitment, and growth.

The two most significant threats to HCV 1.3 plants in the project zone have been illegal logging (most HCV 1.3 plants are timber species) and habitat loss by fire, small scale agriculture, and conversion to oil palm. As mentioned under HCV 1.2, the cessation of logging, apart from limited selective timber harvesting for local consumption in the project zone, is the main conservation intervention measure of the project. In addition, the project has aimed to protect all remaining forest by eliminating any further conversion to oil palm and controlling fire. In doing so, project activities have served to maintain or enhance HCV 1.3 plants by eliminating the two main threats to long-term viability of plant populations.

There is the possibility that livelihood activities supported by the project could take place in a location where HCVs 1-3 are present (e.g., limited wood production for local subsistence consumption through selective logging). Considerations for how to minimize such impacts were discussed in Section 4.1.3, and have been adopted by the project. The key element of a management strategy to minimize this potential negative impact has been ensuring subsistence harvesting levels do not exceed those required to maintain or enhance viable populations of HCV 1.3 tree species whose harvest may be permitted as part of a broader livelihoods development program (e.g., *Shorea uliginosa* in mixed peat swamp forest or *Shorea balangeran* in freshwater swamp and riparian forest).

Herptofauna. Seventeen HCV 1.3 reptiles have been identified as likely or potentially present in the project zone, seven of which have been confirmed in neighboring TPTN. Of these, five are listed as Endangered by IUCN: False Ghavial (*Tomistoma schlegelii*), Malayan giant turtle (*Orlitia borneensis*), Asian brown tortoise (*Manouria emys*), Black-breast leaf turtle (*Geoemyda spengleri*), and Spiny turtle (*Heosemys spinosa)*.

Of particular concern are the False Ghavial (*Tomistoma schlegelii*), which has been hunted to extinction in most of Borneo, and the Estuarine crocodile (*Crocodylus porosus*), both of which are present in TPNP and may be present in the Seruyan River based on reports from villagers in the

Project zone.

Management of these HCV 1.3 species, as well as other herptofauna, has focused on protecting wetland areas and undisturbed forests (preferred habitats for Bornean herptofauna), reducing hunting, and maintaining water quality in rivers and wetlands. Sedimentation, river pollution by oil palm effluent and nutrient loading, and destructive fishing practices (e.g. cyanide) all have negative impacts on the distribution and viability of water/river-dependent species. As the project has aimed to (i) protect habitat for these species by protecting forest and associated wetland areas, (ii) prevent further industrial agricultural encroachment (with attendant negative impacts on water quality), and (iii) conduct environmental education awareness and livelihood activities focused on the promotion of sustainable fishing practices and avoidance of hunting of HCV species, net project impacts on HCV 1.3 herptofauna have served to maintain or enhance this HCV.

Conclusion. Overall, conservation efforts made by the project during this monitoring period to protect remaining natural forests and prevent further degradation of river quality have resulted in net positive impacts on HCV 1.3 species that have been shown to exist in the project zone or likely exist in the project zone.

HCV 1.4 Areas that Contain Critical Habitat of Temporary Use by Species or Congregations of Species

Three habitat types under HCV 1.4 were highlighted as potentially present in the project zone: (i) lakes and open water bodies; (ii) grassy banks and slow-moving, shallow rivers; and (iii) possible ecotonal transitions among major ecosystem types that may be important as travel routes for locally nomadic frugivores, such as the orangutan. Major current and future threats to wildlife dependent on lakes and open water bodies include pollution caused by oil palm plantation run-off (and possible improper treatment of mill effluent), conversion of shoreline ecosystems due to expanding human habitations, and possible over-hunting and fishing. Major threats to grassy banks and slow moving rivers, as well as ecotonal transitions, are habitat destruction and degradation through logging, fires, and conversion to oil palm.

Project activities to mitigate these threats, and enhance HCV 1.4 management, include identification and protection of potentially important wetland bird areas (including efforts to protect shoreline areas of Lake Sembuluh), education outreach to raise awareness about the importance of maintaining water quality to local livelihoods and wildlife and the impact of different local practices on water quality, identification and protection of ecotonal transitions from, e.g., wetland to non-wetland and from kerangas to non-kerangas.

Conclusion. Combined impacts of the project to eliminate the risk of widespread forest loss and ecosystem conversion to oil palm, together with efforts to map and protect potentially important wetland areas and ecotonal transitions, shoreline vegetation along Lake Sembuluh, and possibly other wetlands, as well as education outreach to raise awareness and change behaviors related to human impacts on water quality and wetland protection, have shown net positive impacts on HCV 1.4.

HCV 2.1 Large Landscapes with Capacity to Maintain Natural Ecological Processes and Dynamics

HCV 2.1 was deemed not present in the project zone. Therefore no specific management to maintain this value is recommended. It is noted, however, that if the project succeeds in protecting and potentially enlarging forest cover and connectivity in the project zone, then it is possible in the long term that this project will restore the large intact landscape function (HCV 2.1) once present in the area.

HCV 2.2 Areas that Contain Two or More Contiguous Ecosystems

HCV 2.2 aims to identify and maintain ecotones and ecoclines that connect different ecotypes (ecosystem classes), especially where they occur in large forest landscapes. Such transitional environments are important not only for the maintenance of key ecosystem functions, by ensuring movement of species and flux of materials and energy across boundaries, but also as centers of biodiversity in their own right.

For the project zone and nearby TPNP, maintenance of ecotones has been important for long-term population viability of mobile, locally nomadic frugivorous vertebrates that forage among multiple habitat types tracking seasonal availability of fruit. Broadly different ecosystem types often show asynchronous phenological patterns of fruiting, and therefore enable specialist frugivores, such as hornbills and gibbons, to maintain a positive energy balance by tracking fruit availability among different habitat types. Such taxa present in the project zone and nearby TPNP include orangutans, gibbons, bearded pigs, pigeons, and fruit bats among others.

Ecosystem transitions listed under HCV 2.2 in the Toolkit present in the project zone include the following:

Adjacent wetland and non-wetland area. The most notable wetland to non-wetland transition in the project zone occurs along the western edge of Lake Sembuluh.

Adjacent swamps and non-swamp areas. The swamp to non-swamp transitions are centered on three kinds of swamp: (i) shallow periodically inundated grasslands or marshes; (ii) freshwater or riparian swamps; and (iii) peat swamps.

Adjacent kerangas and non-kerangas areas. Kerangas to non-kerangas are most common in northern parts of the project zone.

The main threats to this HCV are uncontrollable spread of wildfires into peat forest areas adjacent to periodically inundated grasslands in the south, and continued expansion of oil palm, in particular southward from the estate in the north.

Conclusion. Conservation efforts carried out by the project to protect remaining natural forests by (i) reducing fire risk through prevention of logging, (ii) fighting fires directly through construction of observation towers and development and deployment of firefighting teams and equipment, and (iii) prevention of continued expansion of oil palm, have resulted in net positive impacts on HCV

2.2 in the project zone.

HCV 2.3 Areas that Contain Populations of Most Naturally Occurring Species

HCV 2.3 aims to identify landscapes supporting representative populations of most naturally occurring species in the study region and with a capacity to maintain such populations in the long term.

The project zone is an important part of a large landscape mosaic of diverse natural and anthropogenic ecosystem types, covering c. 500,000 ha of terrestrial and aquatic ecosystems. This area includes c. 266,000 ha of natural forest, representing at least five major terrestrial ecosystem types; numerous ecotonal transitions among contrasting terrestrial ecosystem; a complex network of rivers and associated riparian environments draining nutrient-poor sandy soils and/or peat swamps, which produce so-called 'black water rivers' with distinctive aquatic fauna; and (iv) a large black water lake system (Lake Sembuluh).

The area is considered likely to support some of the largest populations of threatened and protected species known from south central Kalimantan, including a total of 361 species of birds, 167 species of mammals (including 45 species of bats), and at least 180 species of free-standing large woody plants (excluding orchids, pitcher plants, lianas, epiphytes, and understory herbs).

HCV 2.3 is therefore considered present in the project zone and nearby TPNP, to which it makes vital contributions of lowland habitat to support landscape-level populations of most naturally occurring species.

The two largest threats to HCV 2.3 are habitat degradation and conversion resulting from oil palm expansion and wild fire. Possible future threats include intensified logging and hunting. Presence of HCV 2.3 in an area is effectively a combination of dimensions of HCVs 1.2 and 1.3, relating to species, and HCVs 1.1, 1.4, 2.1, and 3, relating to habitats. For this reason, the analysis provided relating to net positive project impacts on these component values applies to HCV 2.3 as well.

Conclusion. Overall, conservation efforts made by the project to protect remaining natural forests by preventing oil palm expansion, logging, and fires, combined with efforts to prevent further degradation of river quality and open wetlands have resulted in net positive impacts on HCV 2.3 in the project zone.

HCV 3 Rare or Endangered Ecosystems

All remaining natural vegetation types in the project zone are provisionally considered rare or endangered ecosystems under HCV 3. Immediate threats to HCV 3 include all factors described above as drivers of habitat loss and forest conversion within the project zone. All conservation activities described above in relation to prevention of continued forest loss and ecosystem conversion apply to management of HCV 3.

Conclusion. Conservation efforts planned by the project to protect all remaining natural forests and other natural ecosystem by (i) reducing fire risk through prevention of widespread illegal logging, (ii) fighting fires through immediate detection using observation towers and rapid

response through deployment of firefighting teams and equipment, and (iii) prevention of continued expansion of oil palm have resulted in net positive impacts on HCV 3 in the project zone.

5.1.2.1 Invasive Species (B1.3)

The Rimba Raya project plan includes both an enrichment component for forested areas (divided into 40 blocks, I - XL) that may have been slightly degraded due to illegal logging, and a rehabilitation component for deforested and highly degraded areas (divided into 60 blocks, A – BH) that required significant restoration work. The species that are used for enrichment and rehabilitation are listed in Table 34 below. None of these species are invasive.

No.	Species		Block Plantation
	Local Name	Scientific Name	
I	**ENRICHMENT PLANTING**		
1	Meranti	*Shorea sp.*	I - XL
2	Jelutung	*Dyera costulata*	I - XL
3	Ramin	*Gonystylus bancanus*	I - XL
4	Keruing	*Dipterocarpus sp*	I - XL
5	Ulin	*Eusideroxylon zwageri*	I - XL
6	Tengkawang	*Shorea stenoptera*	I - XL
7	Merawan	*Hopea sp*	I - XL
8	Dahu	*Dracontomelon sp.*	I - XL
9	Melur	*Dacrydium sp*	I - XL
10	Gelam	*Melaleuca sp*	I - XL
11	Nyatoh	*Palaquium sp)*	I - XL
12	Terentang	*Campnosperma sp*	I - XL
13	Pulai	*Alstonia scholaris*	I - XL
14	Durian Hutan	*Durio Sp.*	I - XL
15	Bintangur	*Callophyllum sp.*	I - XL
16	Jambu-jambu	*Eugenia sp.*	I - XL
17	Kayu Arang	*Diospyros sp.*	I - XL
18	Resak	*Vatica sp.*	I - XL
19	Puspa	*Schima sp*	I - XL
20	Saninten	*Castanopsis sp.*	I - XL
21	Gembor,	Alseodaphne spp.	I - XL
22	Karet hutan (Hevea brasiliensis Mull.Arg)	Hevea brasiliensis Mull.Arg	I - XL
II	**REHABILITATION PLANTING**		
1	Jabon	*Antocephalus cadamba*	A-BH
2	Binuang	*Octomeles sumatrana Miq*	A-BH
3	Makaranga	*Macaranga sp*	A-BH

Table 34. Species to be used for Rimba Raya project rehabilitation and enrichment activities

5.1.2.2 Impacts of Non-native Species (B1.4)

The project proponent guarantees that there has been no use of non-native species by the project.

5.1.2.3 GMO Exclusion (B1.5)

The project proponent guarantees that no GMOs have been used or will be used to generate GHG emission reductions or removals.

5.2 Offsite Biodiversity Impacts

5.2.1 Negative Offsite Biodiversity Impact Mitigation (B2.2)

To gauge off-site impacts to biodiversity that may be caused by the project, the project proponent has been monitoring the movements and business activities of oil palm companies that are planning to retire their licenses in the project area as a result of project activities.

The project has also documented the political economic dimensions of illegal logging activities in the project zone (e.g., where loggers originate, who is funding the illegal logging) and report the activity to appropriate authorities. Alternative job opportunities have been sought for local residents involved in the illegal logging through community development initiatives such as the forest and fire patrol system. The project has also attempted to track where illegal logging operations relocate, in an effort to monitor off-site impacts to biodiversity.

It should be noted, finally, that any potential off-site negative impacts to biodiversity have been more than offset by the project's role as a physical buffer to TPNP and the protection that the project has already offered to the park's biodiversity.

The table below summarizes project activities and status of implementation.

	Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
1	Maintain and enhance forests in the project zone to avoid disconnection of HCV1.1 forests from the Project area	on progress	Routine data collection for land cover in Rapid assessment activity - performed 2x/month. Monitoring fire danger rating (FDR) based on mini weather station (MWS) data.	Jul-15	ongoing	Perform routine patroli and FDR monitoring. Patrol intensity level depends on FDR monitoring result.	Concession Manager and Unit Manager
2	Allow selective logging for local consumption, but protect all remaining forests	on progress	Routine patrol is conducted 2x/month. Socialization in regards the necessary logging and illegal logging is performed based on necessity and village agreement.	Jan-15	ongoing	Perform routine patrol and socialization to villagers - socialization based on necessity and inquiry.	Concession Manager
3	Protection of the Seruyan and its tributaries through stabilizing land use and potentially replanting some areas to restore riparian zone and flood plain buffers. Education program for local communities.	on progress	Replanting in North unit on burnt area in the buffer zone. Replanting in Central unit on burnt area in Tatah Ji. The activities are performed to prevent fire and to rehabilitate the riparian area, as well the community livelihood - in fishing	Jul-15	ongoing	Develop 2 nurseries in Ulak Batu and Muara Dua and obtain pulled-out seedling from forest.	Biodiversity Technical Staff and Unit Manager
4	Protecting all remaining forests (esp. natural forests) and wetlands; prevent further conversion to industrial scale agriculture; reducing hunting through education and	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil. Hunter education has started in the Forest Field School at the	Jul-15	ongoing	Develop curriculum material for Forest Field School.	Concession Manager Biodiversity Technical Staff

	awareness campaigns		junior high and high school levels				
5	Lakes & water bodies: Education and protection of important bird areas	on progress	The project has avoided conversion of 44,263 ha into palm oil which has resulted in allowing the lakes and water bodies to remain intact.	Mar-15	ongoing	Perform routine survey for data collection and flora and fauna monitoring. Collaborate with community program for forest field school.	Concession Manager Biodiversity Technical Staff
6	Grassy banks & slow moving rivers: Education and protection of areas important to birds for nesting or foraging	on progress	The project has avoided conversion of 44,263 hectares into palm oil which has resulted in allowing the lakes and water bodies to remain in tact	Mar-15	ongoing	Perform routine survey for data collection and flora and fauna monitoring. Collaborate with community program for forest field school.	Concession Manager Biodiversity Technical Staff
7	Ecotones: Protection of forest and wetland ecotones from any form of disturbance	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil.	Jul-15	ongoing	Perform data collection process from Rapid Assessment activity, flora and fauna monitoring, and routine patrol	Concession Manager Biodiversity Technical Staff
8	Potential to enhance landscape level forest connectivity (in turn restoring this HCV) by preventing further isolation of remaining fragments and reconnecting large remnant patches of forest	on progress	Develop and extend the green corridor by replanting programs and protect the area by routine patrol	Jul-15	ongoing	Perform replanting on burnt area and routine patrol	Concession Manager Biodiversity Technical Staff
9	Protecting wetlands and forests where ecotones exist	on progress	The project has avoided conversion of 44,263 hectares into palm oil which has resulted in protecting wetlands and forests where	Jul-15	ongoing	Perform routine patrol, data collection and land cover mapping	Concession Manager and Climate & GIS Technical Staff

			ecotones exist.				
10	Protecting wetlands and forests; reduce hunting	on progress	The project has avoided conversion of 44,263 ha into palm oil which has resulted in protecting wetlands and forests.	Jul-15	ongoing	Perform routine patroli and socialization to community in regards legal hunting method where it doesn't bring dangerous impact to forest	Biodiversity Technical Staff and Unit Manager
11	Not to clear forest in HCV 3 areas	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil.	Jul-15	ongoing	Perform routine patrol, data collection and land cover mapping	Concession Manager and Climate & GIS Technical Staff
12	Monitoring of business activities of oil palm companies that have retired their licenses in the PA	on progress	The project has monitored and reported activities of the agent of deforestation in the leakage buffer zone	Jul-15	ongoing	Annual remote sensing as described in the monitoring plan	Climate and Gis Technical Staff
13	Document economic dimensions of illegal logging activities and report to appropriate authorities	on progress	The project has monitored and reported activities of any illegal logging identified in the Carbon Accounting area and buffer zone	Jul-15	ongoing	Annual remote sensing and ground based measurements as described in the monitoring plan	Climate and Gis Technical Staff
14	Provide alternative job opportunities	on progress	Develop economic work group for local community	Jul-15	ongoing	Develop fisherman work group in Muara Dua, Tanjung Rangas, and Sungai perlu. Develop agriculture work group in Muara Dua	RRC Project manager
15	Track location of illegal logging operations	on progress	Develop map of vulnerable area	Jul-15	ongoing	Perform routine patrol and capture land/area pictures by drone	Climate and Gis Technical Staff

5.2.2 Net Offsite Biodiversity Benefits (B2.3)

The project has not had any negative impacts on biodiversity outside the project zone resulting directly from project activities. There is the possibility for activities currently active in, or slated for, the project area to be displaced into neighboring areas or other parts of Kalimantan. For example, oil palm companies that are unable to operate in the project area (as a result of the project) may purchase licenses to operate in neighboring areas, having a clear negative impact on biodiversity in that area. Similarly, illegal logging currently taking place in the project area may be displaced into other neighboring areas, intensifying damage to these areas.

At a landscape spatial scale, oil palm development and illegal logging has continued to spread into other areas regardless of project activities in the project area. This can be argued based on the current distribution of both activities in and near the project zone, existing oil palm licenses in the region, local development plans for a major crude palm oil export facility on the southern coast of the project area and ongoing expansion of both activities across Kalimantan. For oil palm, current land use planning in Kalimantan, current and predicted expansion rates for oil palm in Kalimantan, and continued market demand for this relatively inexpensive oil indicate that oil palm will continue its rapid expansion. For illegal logging, a lack of enforcement of Indonesian laws limiting unpermitted logging and timber export, and continuing global markets for cheap, illegal wood, indicate that this threat to biodiversity will likely also continue.

The project's presence may shift the spatio-temporal dynamics and/or intensity of when these activities reach other areas in the immediate vicinity, but given the full range of factors driving oil palm expansion mentioned above, the incremental impact within the project zone and adjacent areas is likely to be small. One possible exception is the short-term response of the four oil palm companies whose licenses are retired if the project is implemented as planned. If these licenses are simply retired through a commercial transaction, then off-site biodiversity impacts will be zero. If a license swap is pursued, whereby the current licenses are retired and/or traded for licenses in new areas, then biodiversity impacts in these new areas will be negative. In this scenario, net biodiversity impacts will depend on exactly where such licenses are established, and subsequent comparisons of biodiversity gains in the project area compared to biodiversity losses where the new licenses are issued. The project has a clear plan for tracking the future business activities of the companies whose licenses will be retired in the 'with project' scenario.

From a biodiversity perspective, both oil palm and illegal logging are environmentally unsustainable options, to be minimized or avoided wherever possible. By creating and protecting a large area of natural habitat contiguous with TPNP, the project has helped to maintain and enhance biodiversity in a region that would otherwise be degraded or lost to these two activities. Maintaining biodiversity in rain forests is highly dependent on maintaining ecosystem dynamics between species, and retaining large enough tracts of habitat for species with the largest ranges. Oil palm plantations completely

uncouple ecosystem dynamics and illegal logging can heavily disturb the dynamic and make forests susceptible to fire, which results in vast losses of biodiversity.

The presence of the project and its biodiversity related project activities have created benefits within the project zone that are unparalleled in comparison with the expected impacts of oil palm expansion into the area (as well as offsite areas) had the project not been present. The benefits which exist within the project zone greatly outweigh the potential impacts of unmitigated negative offsite action. Because of the project and its implemented project activities, the net effect of the project on biodiversity in and around the project zone is positive.

5.3 Biodiversity Impact Monitoring

5.3.1 Biodiversity Monitoring Plan Development (B3.3)

As per the CCB Standard v2.0, inclusion of the biodiversity monitoring plan in this report is not necessary if the monitoring plan has been previously included and successfully validated as part of the project description document. Included in the table below (Table 35) is a summary of the biodiversity monitoring components that were monitored during this report period. Please see the CCB project description document to view the entire biodiversity monitoring plan (CCBA_PDD_Verification_2011.09.20_Final.pdf).

Table 35: Summary of Biodiversity Monitoring

Monitoring Component		Activity and Years	Times and Periods	Detection frequency	Remote sensing data, resolution, coverage and years	Reporting frequency
Preliminary Biodiversity Monitoring Components	Forest Cover and Condition	Identification of change in forest cover classes with ecosystem-specific methods.	Every six months	six monthly	Medium- resolution imagery (e.g. Landsat 7)	Annually
		Identification of change in forest cover classes with ecosystem-specific methods	Annually	Annually	High-resolution imagery (Ikonos, QuickBird, or aerial photography)	Annually
		Ground patrol to check permanent 10- 20 km transects for tree loss	Continuously	Continuously	n/a	Annually
	Plant and Wildlife Populations	Survey of indicator species for plants, birds, mammals, and herpetofauna	Annually	n/a	n/a	Bi-annually
		Orangutan Survey	Continuously	n/a	n/a	Annually
	Quality and Condition of Aquatic and Wetland	Monitoring of water quality in the Seruyan River and Lake Sembuluh.	Ongoing	As required	n/a	As required

Monitoring Component		Activity and Years	Times and Periods	Detection frequency	Remote sensing data, resolution, coverage and years	Reporting frequency
	Ecosystems					
	Fire	See Section 3.1.3				
Comprehensive Biodiversity Monitoring Component - HCVs	Ecosystem mapping	Field survey to describe vegetation types based on structural attributes and diagnostic species assemblages.	Annually	Bi-annually	n/a	Bi-annually
		Develop draft vegetation map integrating these data with other secondary sources such as improved soil maps, geology, and land systems	Annually	Bi-annually	High resolution imagery used in climate component	Bi-annually
	Confirmation of Species Likely or Potentially Present	Undertake Botanical Survey, document possible population estimation of HCV 1.2 (Critically Endangered Species) and 1.3 (Areas that Contain Habitat for Viable Populations of Endangered, Restricted Range or Protected Species) species. One area of special consideration should be the survey of orchids and other rare epiphytic plants.	Annually	Bi-annually	n/a	Bi-annually
		Undertake Avifaunal surveys to confirm the presence of bird species considered likely or potentially present under HCV 1.2 and 1.3 and to begin developing a sense for areas rich in rare, threatened, or protected bird species. Bird surveys should be carried out in coordination with surveys for other taxa, in particular plants, and the selection of survey sites should be informed by refined vegetation maps.		Bi-annually	n/a	Bi-annually

Monitoring Component		Activity and Years	Times and Periods	Detection frequency	Remote sensing data, resolution, coverage and years	Reporting frequency
		Undertake Mammal surveys, Orangutan survey could/should be separate project.		Bi-annually	n/a	Bi-annually
		Undertake Herptofauna surveys. Focus on Painted river terrapin, the False Ghavial (Tomistoma schlegelii) and the Estuarine Crocodile (Crocodylus porosus).		Bi-annually	n/a	Bi-annually
	Bird Survey of Lake Sebuluh	Undertake Bird survey and confirm previously recorded species.	Annually	Bi -annually	n/a	Bi-annually
	HCV Full Assessment	Identify HCV 3 (Rare or Endangered Ecosystems) in the Project zone using the Analytical Method described in the revised HCV Toolkit.	Annually	Bi - annually	n/a	Bi-annually
		Conduct follow- up assessment of HCVs 5 & 6, should be done as part of community assessment	Annually	Bi - annually	n/a	Bi-annually

5.3.2 Biodiversity Monitoring Results (B3.1, B3.2)

Activities implemented or planned are summarized in the table below. Biodiversity Monitoring Activities are conducted periodically every year with a target of 8 transect lines. This activity has been implemented in the period 2014 – 2015, while for the period 2016 - 2017, biodiversity monitoring activities have been incorporated into Rapid Assessment activities.

Rapid Assessment, or "Brief/Short Assessment", is a joint activity of Climate and Biodiversity activities, which is done to fulfill the preconditions to complete the Periodic Forest Inventory (Inventarisasi Hutan Menyeluruh Berkala - IHMB). This activity consists of several monitoring at once:

- Access, hotspots, and illegal logging Monitoring
- Depth and type of Peat Monitoring
- Land Cover and vegetation conditions Monitoring
- Orangutan's Fauna and Nest Monitoring

During this monitoring period, the project has furthered progress in the building of an orangutan release center in the project area, and ten orangutans were successfully released in May of 2017. The project has also continued field monitoring for detection of vulnerable and endangered species as well as the development of maps detailing areas at risk within the project. Further, the project has continued to monitor and protect the boundaries of the Project from the agents of deforestation and the impacts of fire.

Details about project activities and progress made in the latest monitoring period can be viewed in the table below.

Since project commencement, the project has directly and indirectly contributed to the net positive biodiversity impact in the areas. Directly the project has provided financial support to OFI to continue with its work to rehabilitate and release orangutans back into the forest.

Indirectly the project has avoided the conversion of more than 15,198 ha of peat swamp forest compared with the baseline scenario. This forest represents a significant habitat that will be extremely important to the ongoing protection of the orangutans in the future as well as countless other species, many of which are vulnerable or endangered.

	Activities	Status	Implementation details	Start date	Finish date	Steps necessary to start/finish activity	Responsibility
1	Maintain and enhance forests in the project zone to avoid disconnection of HCV1.1 forests from the Project area	on progress	Routine data collection for land cover in Rapid assessment activity - performed 2x/month. Monitoring fire danger rating (FDR) based on mini weather station (MWS) data.	Jul-15	ongoing	Perform routine patroli and FDR monitoring. Patrol intensity level depends on FDR monitoring result.	Concession Manager and Unit Manager
2	Allow selective logging for local consumption, but protect all remaining forests	on progress	Routine patrol is conducted 2x/month. Socialization in regards the necessary logging and illegal logging is performed based on necessity and village agreement.	Jan-15	ongoing	Perform routine patrol and socialization to community members - socialization based on necessity and inquiry.	Concession Manager
3	Protection of the Seruyan and its tributaries through stabilizing land use and potentially replanting some areas to restore riparian zone and flood plain buffers. Education program for local communities.	on progress	Replanting in North unit on burnt area in the buffer zone. Replanting in Central unit on burnt area in Tatah Ji. The activities are performed to prevent fire and to rehabilitate the riparian area, as well the community livelihood - in fishing	Jul-15	ongoing	Develop 2 nurseries in Ulak Batu and Muara Dua and obtain pulled-out seedling from forest.	Biodiversity Technical Staff and Unit Manager

4	Protecting all remaining forests (esp. natural forests) and wetlands; prevent further conversion to industrial scale agriculture; reducing hunting through education and awareness campaigns	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil. Hunter education has started in the Forest Field School at the junior high and high school levels	Jul-15	ongoing	Develop curriculum material for Forest Field School.	Concession Manager Biodiversity Technical Staff
5	Lakes & water bodies: Education and protection of important bird areas	on progress	The project has avoided conversion of 44,263 ha into palm oil which has resulted in allowing the lakes and water bodies to remain intact.	Mar-15	ongoing	Perform routine survey for data collection and flora and fauna monitoring. Collaborate with community program for forest field school.	Concession Manager Biodiversity Technical Staff
6	Grassy banks & slow moving rivers: Education and protection of areas important to birds for nesting or foraging	on progress	The project has avoided conversion of 44,263 hectares into palm oil which has resulted in allowing the lakes and water bodies to remain in tact	Mar-15	ongoing	Perform routine survey for data collection and flora and fauna monitoring. Collaborate with community program for forest field school.	Concession Manager Biodiversity Technical Staff
7	Ecotones: Protection of forest and wetland ecotones from any form of disturbance	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil.	Jul-15	ongoing	Perform data collection process from Rapid Assessment activity, flora and fauna monitoring, and routine patrol	Concession Manager Biodiversity Technical Staff
8	Potential to enhance landscape level forest connectivity (in turn restoring this HCV) by preventing further isolation of remaining	on progress	Develop and extend the green corridor by replanting programs and protect the area by routine patrol	Jul-15	ongoing	Perform replanting on burnt area and routine patrol	Concession Manager Biodiversity Technical Staff

	fragments and reconnecting large remnant patches of forest						
9	Protecting wetlands and forests where ecotones exist	on progress	The project has avoided conversion of 44,263 hectares into palm oil which has resulted in protecting wetlands and forests where ecotones exist.	Jul-15	ongoing	Perform routine patrol, data collection and land cover mapping	Concession Manager and Climate & GIS Technical Staff
10	Protecting wetlands and forests; reduce hunting	on progress	The project has avoided conversion of 44,263 ha into palm oil which has resulted in protecting wetlands and forests.	Jul-15	ongoing	Perform routine patrol routine and socialization to community in regards legal hunting method where it doesn't bring dangerous impact to forest	Biodiversity Technical Staff and Unit Manager
11	Not to clear forest in HCV 3 areas	on progress	The project has avoided the conversion of 44,263 hectares of peat swamp forest to palm oil.	Jul-15	ongoing	Perform routine patrol, data collection and land cover mapping	Concession Manager and Climate & GIS Technical Staff
12	Monitoring of business activities of oil palm companies that have retired their licenses in the PA	on progress	The project has monitored and reported activities of the agent of deforestation in the leakage buffer zone	Jul-15	ongoing	Annual remote sensing as described in the monitoring plan	Climate and Gis Technical Staff
13	Document economic dimensions of illegal logging activities and report to appropriate authorities	on progress	The project has monitored and reported activities of any illegal logging identified in the Carbon Accounting area and buffer zone	Jul-15	ongoing	Annual remote sensing and ground based measurements as described in the monitoring plan	Climate and Gis Technical Staff

14	Provide alternative job opportunities	on progress	Develop economic work group for local community	Jul-15	ongoing	Develop fisherman work group in Muara Dua, Tanjung Rangas, and Sungai perlu. Develop agriculture work group in Muara Dua	RRC Project manager
15	Track location of illegal logging operations	on progress	Develop map of vulnerable area	Jul-15	ongoing	Perform routine patrol and capture land/area pictures by drone	Climate and Gis Technical Staff

Table 36: Biodiversity monitoring results.

5.3.3 Monitoring Plan and Results Dissemination (B3.3)

Field monitoring occurs within each field unit on a minimum of a weekly basis, and in some locations where there is concern for, or a history of encroachment, it can be as frequently as daily. Monitoring trip reports are kept at the field unit level for each trip and compiled by field unit manager as a summary to be provided to the Sampit office on a monthly basis. APCS uses these reports along with work progress reports to provide a monthly report to InfiniteEARTH and RRC Jakarta office and to prepare the annual period monitoring plan. The reports are available by anyone upon request and actively disseminated to all stakeholders on an annual basis prior to any upcoming audit. Summaries of monitoring results are disseminated within communities using the community information boards.

5.4 Optional Criterion: Exceptional Biodiversity Benefits

The Rimba Raya project is applying for Gold Level status under the CCB standard on the basis of meeting the Vulnerability Criterion during this monitoring period. Additionally, the Project qualifies under the Irreplaceability Criterion due to the large population of Bornean orangutans within the project area and nearby TPNP. Both criteria are demonstrated as being met below.

Based on data from neighboring Tanjung Puting National Park, the Rimba Raya project area is very likely to have a large number of globally threatened species. Forest between TPNP and the project area is contiguous, with similar vegetation types, forest structure and ecosystem mosaics. Species previously identified in TPNP are therefore a solid proxy for species likely to occur in the project area. As displayed in the table below, a total of 54 species listed as Critically Endangered or Endangered by IUCN are likely present in the Rimba Raya project area, 8 of which were confirmed present within the project area in the current monitoring period. An additional 40 species listed as Vulnerable by IUCN are likely present in the project area, 14 of which were confirmed within the project area.

There are 14 Critically Endangered (CR) and Endangered (EN) species confirmed present in the project area during this monitoring period. Most notable among these is the Bornean orangutan (EN). The full list of species present in the supporting document: Basic Information - Audit 2017_5.doc.

Table 37: Critically Endangered or Endangered Species within the Project area

Estimated Total and Confirmed Number of Endangered, Threatened & Vulnerable Species Found in Project area		
	CR & EN Species	**VU Species**
	Total (confirmed)	**Total (confirmed)**
Mammal	4	4
Bird	0	2
Plant	3	6
Reptile	1	2
Total	**8**	**14**

Table 38: Critically Endangered and Endangered Species Lists

Endangered & Critically Endangered Species Found in Project area		
Mammals		
Nasalis larvatus larvatus	Bekantan	EN
Pongo pygmaeus wurmbii	Orangutan	EN
Hylobates albibarbis	Owa	EN
Manis javanica	Trenggiling	CR
Plants		
Shorea smithiana Symington -Neolamarchia cadamba	Lanan	CR
Shorea sp	Meranti	CR
Shorea pauciflora King	Ubar	EN
Reptiles		
Heosemys spinosa	Kura-kura gambut	EN

Table 39: Vulnerable Species

Vulnerable Species Found in Project area	
Mammals	
Sus barbatus	Babi Hutan
Helarctos malayanus	Beruang Madu
Pteropus sp	Kelelawar
Rusa unicolor	Rusa
Birds	
Leptoptilos javanicus	Bangau Tongtong
Pycnonotus zeylanicus	Pampulu
Plants	
Baccaurea spp	Asam-Asam
Dyera polyphylla (Miq.) Steenis	Jelutung
Garcinia sp	Manggis Hutan
Gonystylus bancarus	Ramin
Combretocarpus rotundatus	Tumih
Eusideroxylon swageri	Ulin
Reptiles	
Tomistoma schlegelii	buaya sapit
Cuora amboinensis	Kura - Kura Tangkup

6 ADDITIONAL PROJECT IMPLEMENTATION INFORMATION

6.1 Records and Information

In accordance with project requirements all documents and records are kept in a secure and retrievable manner. The project proponent is committed to the storage of data for at least two years after the end of the project crediting period.

The electronic and hard copy data sources are stored in the locations described in Table 40.

Data / Information	Location 1	Location 2	Location 3
Project design documents/plans/procedures	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**Environmental Accounting Services (EAS)** 50 Charles Court, Lake Hawea, Wanaka RD2, 9382New Zealand	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia
Satellite images	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia	**ecoPartners LLC** 2930 Shattuck Ave Suite 305 Berkeley, CA 94705
Land Use Land cover change files	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia	**ecoPartners LLC** 2930 Shattuck Ave Suite 305 Berkeley, CA 94705
Hard copies of field patrols	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**Rimba Raya Field Office** Jl .Nangka II No.62 RT/RW : 08/02 Kel. Ketapang, Kec. Mentawa Baru Hulu Sampit – Kalimantan Tengah	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia
Carbon and biodiversity related Field Patrol Reports	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**Rimba Raya Field Office** Jl .Nangka II No.62 RT/RW : 08/02 Kel. Ketapang, Kec. Mentawa Baru Hulu Sampit – Kalimantan Tengah	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia
Community engagement field data	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10	**World Education** World Education Jalan Tebet Dalam IV-D Number	**Rimba Raya Field Office** Jl .Nangka II No.62

Data / Information	Location 1	Location 2	Location 3
	Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	5A Jakarta 12810 Indonesia	RT/RW : 08/02 Kel. Ketapang, Kec. Mentawa Baru Hulu Sampit – Kalimantan Tengah
Community Engagement Summary Reports	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**World Education** World Education Jalan Tebet Dalam IV-D Number 5A Jakarta 12810 Indonesia	**Rimba Raya Field Office** Jl .Nangka II No.62 RT/RW : 08/02 Kel. Ketapang, Kec. Mentawa Baru Hulu Sampit – Kalimantan Tengah
Monitoring reports and calculations	**Orangutan Foundation International (OFI)** Jalan Hasanuddin No. 10 Blk DKD Pangkalan Bun Kalimantan Tengah 74111, Indonesia	**PT Pandu Maha Wana** Asia Pacific Consulting Solutions Jl. Veteran, Gg Jempinis No.17, Banjar Uma Kepuh, Desa Buduk. Mengwi, Badung 80351 Bali - Indonesia	**ecoPartners LLC** 2930 Shattuck Ave Suite 305 Berkeley, CA 94705

Table 40: Data and Information Storage Locations

6.2 Quality Assurance and Quality Control

An internal Quality Control (QC) and Quality Assurance (QA) process has been developed and followed. The detailed procedures are outlined in the 'QA_QC ProcessV1.2'. A brief summary of the QA/QC procedures are described below.

6.2.1 Field Measurement Procedures and Field Data Collection

To verify that plots have been installed and the measurements taken correctly, 10-20% of plots shall be randomly selected and re-measured independently. Key re-measurement elements include the location of plots, DBH and tree height. The re-measurement data shall be compared with the original measurement data. Any deviation between measurement and re-measurement below 5% will be considered tolerable and error above 5%. Any errors found shall be corrected and recorded. All errors discovered should be expressed as a percentage of all plots that have been rechecked to provide an estimate of the measurement error.

6.2.2 Remote Sensing

Remotely sensed data was collected and processed in accordance with the QA/QC procedures described in the GOFC-GOLD Sourcebook (GOFC-GOLD, 2010). Accuracy assessments of land cover change detected in the monitoring period are carried out consistent with the GOFC-GOLD Sourcebook. A confusion matrix describing the errors of omission and commission was the developed. This procedure will continue to be followed for each image captured and classified as part

of the monitoring program. The Project is working with an independent consultant (ecoPartners LLC) who has extensive in remote sensing techniques.

ecoPartners has documented and established new remote sensing procedures for the LULC classification. The documentation of the current land use / land cover analysis and change detection will assist in consistent reporting of project activities between monitoring periods.

6.2.3 Data Entry and Analysis

Reliable estimation of carbon stock in pools requires proper entry of data into the data analyses spreadsheets. To minimize the possible errors in this process, the entry of both field data and laboratory data shall be reviewed using expert judgment and, where necessary, comparison with independent data to ensure that the data are realistic. Communication between all personnel involved in measuring and analyzing data should be used to resolve any apparent anomalies before the final analysis of the monitoring data is completed. If there are any problems with the monitoring plot data that cannot be resolved, the plot should not be used in the analysis.

6.2.4 Data Storage

Due to the long-term nature of the Rimba Raya project activity, data shall be archived and maintained safely. Data archiving shall take both electronic and paper forms, and copies of all data shall be provided to each project participant. All electronic data and reports shall also be copied on durable media such as CDs and copies of the CDs are stored in multiple locations.

The archives shall include:

- Copies of all original field measurement data, laboratory data, data analysis spreadsheet;
- Estimates of the carbon stock changes in all pools and non-CO2 GHG and corresponding calculation spreadsheets;
- GIS products (including all aerial imagery if applicable);
- Copies of the measuring and monitoring reports.

7 ADDITIONAL PROJECT IMPACT INFORMATION

No additional project impact information is available. All project impacts are identified and discussed in sections 3, 4, and 5 above.

8 REFERENCES

Budidarsono, Suseno; Dewi, Sonya; Sofiyuddin, Muhammad; Rahmanulloh, Arif. "Socio-Economic Impact Assessment of Palm Oil Production" (PDF). World Agroforestry Centre. Retrieved 15 January 2013.

Colchester, M. 2011. Oil palm and indigenous peoples in South East Asia. The International Land Coalition.

Danielsen F1, Beukema H, Burgess ND, Parish F, Brühl CA, Donald PF, Murdiyarso D, Phalan B, Reijnders L, Struebig M, Fitzherbert EB. Biofuel plantations on forested lands: double jeopardy for biodiversity and climate. Conserv Biol. 2009 Apr;23(2):348-58.

Fitzherbert EB1, Struebig MJ, Morel A, Danielsen F, Brühl CA, Donald PF, Phalan B. How will oil palm expansion affect biodiversity? Trends Ecol Evol. 2008 Oct;23(10):538-45.

Lian Pin Koha, Jukka Miettinenb, Soo Chin Liewb, and Jaboury Ghazoula. (2010) Remotely sensed evidence of tropical peatland conversion to oil palm. Proceedings of the National Academy of Sciences of the United States of America. vol. 108 no. 12; 5127–5132.

Norwana, Awang Ali Bema Dayang; Kunjappan, Rejani (2011). "The local impacts of oil palm expansion in Malaysia" (PDF). cifor.org. Center for International Forestry Research. Retrieved 15 January 2013.

Anderson, J.A.R. (1972). Trees of the peat swamp forests of Sarawak. Forest Department, Sarawak, Malaysia.

Aratrakorn, S. et al. (2006) Changes in bird communities following conversion of lowland forest to oil palm and rubber plantations in southern Thailand. Bird Conservation International 16, 71-82

Ashton, P.S. (1982). Dipterocarpaceae. Flora Malesiana. Series 1, Volume 9.

Aukland, L., P.M. Cost, and S. Brown (2003). "A Conceptual framework and its application for addressing leakage: the case of avoided deforestation." Climate Policy 3 (2003) 123–136.

Bebbington, A. (1999). Capitals and Capabilities: A Framework for Analyzing Peasant Viability, Rural Livelihoods and Poverty. World Development. Volume 27, Issue 12, December 1999, Pages 2021-2044.

Benedick, S. et al. (2006) Impacts of rain forest fragmentation on butterflies in northern Borneo: species richness, turnover and the value of small fragments. Journal of Applied Ecology 43, 967-977

bin Jalan B. & Galdikas B. M. F. (1986) Birds of Tanjung Putting National Park, Kalimantan Tengah. A preliminary list. Kukila 3 (1-2): 33-37.

BirdLife International (2001) Threatened Birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge.

Boehm, H. e. a. (2001). "Fire Impacts and Carbon Release on Tropical Peatlands in Central Kalimantan, Indonesia." 22nd Asian Conference on Remote Sensing Singapore.

Bolick, L. 2010a. Land Cover Assessment in Rimba Raya Restoration

Concession Central Kalimantan, Indonesia. Technical Report submitted to Infinite Earth February 5, 2010.

Bolick, L. 2009b. Field Report for the Carbon Assessment Survey FINAL July 18.

Bolick, L. 2009c. Field Report for the Carbon Assessment T7-T8 Survey FINAL Dec 30.

Broadbent, E., Asner, G., Pena-Carlos, M., Palace, M., & Soriano, M. (2008). Spatial partitioning of biomass and diversity in a lowland Bolivian forest: linking field and remote sensing measurements. Forest Ecology and Managment , 2602-2616

Brown, S., T. Pearson, D. Slaymaker, S. Ambagis, N. Moore, D. Novelo, and W. Sabido. 2005. Creating a virtual tropical forest from three-dimensional aerial imagery: Application for estimating carbon stocks. Ecological Applications 15: 1083-1095.

Brown, I. M., Wayt Thomas, W., Moreira, M., C., F., & Victoria, R. (1995). Uncertainty in the biomass of Amazonian forests: an example from Rondonia, Brazil. Forest Ecology and Managment, 75, 175-189.

Brown, S. (1997). Estimating biomass and biomass change of tropcial forests, a primer. Forestry Paper 34.

Brown, S., Gillespei, A., & Lugo, A. (1989). Biomass estimation methods for tropical forests with applications to forest inventory data. Forest Science, 35 (4), 881-902.

Brown, S., Hall, M., Andrasko, K., Ruiz, F., Marzoli, W., Guerrero, G., et al. Baselines for land-use change in the tropics: applications to avoided deforestation projects. In Mitigation and Adaptation Strategies for Climate Change, in press.

Brown, S., Iverson, L., & Prasad, A. (2001). Geographical distribution of biomass carbon in tropical southeast Asian forests: a database. US Department of Energy. Oak Ridge, Tennessee: Oak Ridge National Laboratory

Brühl, C. A. (2001). Leaf Litter Ant Communities in Tropical Lowland Rain Forests in Sabah, Malaysia: Effects of Forest Disturbance and Fragmentation, Thesis. Univ. Würzburg, Germany.

Budiono, Kreb D. & Agustina R. (2006) Biodiversity Surveys in the Middle Mahakam Lakes and Wetlands Area in East Kalimantan, Indonesia, 2005. Middle Mahakam Conservation Program, 2006.

Cannell, M. G, (1982) World forest biomass and primary production data. London: Academic Press.

Cannon, C.H., L.M. Curran, A.J. Marshall, M. Leighton. 2007. Long-term reproductive behavior of woody plants across seven Bornean forest types in the Gunung Palung National Park (Indonesia): suprannual synchrony, temporal prodcutivity, and fruiting diversity. Ecology Letters Nature 420, 61-65 (7 November 2002) | doi:10.1038/nature01131; Received 20 March 2002; Accepted 17 September 2002

CARE (2002). Households Livelihood Security Assessments. A Toolkit for Practitioners. Prepared for the PHLS Unit by: TANGO International Inc., Tucson, Arizona 2002.

CARE (2001). Benefits Harms Guidebook. Atlanta, USA.

Case, M., F. Ardiansyah, E. Spector. (2008). Climate Change in Indonesia Implications for Humans and Nature. World Wildlife Fund.

Chang, M.S. et al. (1997) Changes in abundance and behaviour of vector mosquitoes induced by land use during the development of an oil palm plantation in Sarawak. Transactions of the Royal Society of Tropical Medicine and Hygiene 91, 382-386

Chave, J., Andalo, C., Brown, S., Cairns, M., Chambers, J., & Fromard, N. (2005). Tree allometry and improved estimation of carbon stocks and balance in tropical forests. Oecologia (145), 87-99.

Chave, J., Condit, R., Aguilar, S., Hernandez, A., Lao, S., & Perez, R. (2004). Error propagation and scaling for tropical forest biomass estimates. Phil. Trans. Royal Society (359), 409-420.

Chave, J., Muller-Landau, H., Baker, T., Easdale, T., Steege, H., & Webb, C. (2006). Regional and phylogenetic variation of wood density across 2,456 neotropcial tree species. Ecological Applications .

Chey, V.K. (2006) Impacts of forest conversion on biodiversity as indicated by moths. Malay. Nat. J. 57, 383-418

Chung, A.Y.C. et al. (2000) The diversity of beetle assemblages in different habitat types in Sabah, Malaysia. Bulletin of Entomological Research 90, 475-496

Clark, M., Clark, D., & Roberts, D. Small-footprint lidar estimation of sub-canopy elevation and tree height in a tropical forest landscape. Remote Sensing of Environment, 91, 68-9.

Cochrane MA, Alencar A, Schulze MD, Souza CMJ, Nepstad DC, Lefebvre P, Davidson EA (1999) Positive feedbacks in the fire dynamic of closed canopy tropical forests. Science 284:1832–1835.

Collins, N.M., J.A. Sayer and T.C. Whitmore (1991). The Conservation Atlas of Tropical forest: Asia and the Pacific. World Conservation Union/IUCN, Simon & Schuster, New York.

Corley, R.H.V. and Tinker, P.B. (2003) The Oil Palm, Blackwell Science

Couwenberg et al. 2009. Greenhouse gas fluxes from tropical peatlands south-east Asia.

Curran, L. M. et al., (2004), “Lowland Forest Loss in Protected Areas of Indonesian Borneo,” Science, vol. 303, February 2004.

Danielsen, F. et al. (2009) Biofuel plantations on forested lands: double jeopardy for biodiversity and climate. Conservation Biology (In Press)

Danielsen, F. and Heegaard, M. (1995) Impact of logging and plantation development on species diversity: a case study from Sumatra. In Management of tropical forests: towards an integrated perspective (Sandbukt, Ø., ed), pp. 73-92, Centre for Development and the Environment, University of Oslo

Davis, A. and Philips, T. (2005) Effect of deforestation on a southwest Ghana dung beetle assemblage (Coleoptera: Scarabaeidae) at the periphery of Ankasa Conservation Area. Environmental Entomology 34, 1081-1088

Defries R., G. Asner, F. Achard, C. Justice, N. Laporte, K. Price, C. Small, J. Townshend (2005). Monitoring Tropical Deforestation for Emerging Carbon Markets in Reduction of Tropical Deforestation and Climate Change Mitigation" Eds: Paulo Mountinho (IPAM) and Stephan Schwartzman (ED).

Diemont, W.H., GJ Nabuurs, JO Rieley, HD Rijksen (1997). "Climate change and management of tropical peatlands as a carbon reservoir." Biodiversity and Sustainability of Tropical Peatlands.

Drake, J., Know, R., Dubayah, R., Clark, D., Condits, R., Blair, B., et al. (2003). Above-ground biomass estimation in closed canopy Neotropical forests using lidar remote sensing: factors affecting the generality of relationships. Global Ecology & Biogeography (12), 147-159.

Dutson G. C. L., Wilkinson R. J. & Sheldon B. C. (1991) Hook-billed Bulbul, Setornis criniger, and Grey-breasted Babbler, Malacopteron albogulare, at Barito Ulu, Kalimantan. Forktail, 6, 78-82.

Dwiastuti, S., Hut, M., Si IR. Untung Darung, MP Ube Tito, Sp Jenne, S. Hut. 2010 Final Report Measurement of The Peat Bulk Density PT. Rimba Raya Conservation Seruyan Regency of Central Kalimantan, Indonesia. Septmeber 2010.

Ernsting, A., Rughani, D., Boswell, A. (2007). Agrofuels Threaten to Accellerate Global Warming. UNFCC, Bali. Retrieved September, 6 2009 from the biofuelwatch website: http://www.biofuelwatch.org.uk

Falcy, M.R. and Estades, C.F. (2007) Effectiveness of corridors relative to enlargement of habitat patches. Conservation Biology 21, 1341-1346.

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

FAO Forestry Department. 2006a. Country Pages – Indonesia. U.N. Food and Agriculture Organization, Rome, Italy.

FAO Statistics Division. 2006b. ProdSTAT: Crops. U.N. Food and Agriculture Organization, Rome, Italy.

Fitzherbert, E. B. et al. 2008. How will oil palm expansion affect biodiversity? Trends in Ecology and Evolution 23, 538-545.

Foli, E., Alder, D., Miller, H., & Swaine, M. (2002). Modelling growing space requirements for some tropical forest tree species. Forest Ecology and Management, 5855, 1-10.

Forest Carbon (2008). A preliminary carbon estimate in the proposed extension area of Tanjung Puting National Park, Central Kalimantan, Indonesia.

Fredriksson G.M., L. S. Danielsen, J. E. Swenson. 2006. Impacts of El Nino related drought and forest fires on sun bear fruit resources in lowland dipterocarp forest of East Borneo.

Freese, F. (1962). Elementary Forest Sampling (Vol. USDA Handbook 232). Washington, DC: GPO.

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.

Gapki (2006), “Indonesia’s palm oil production expected to rise in 2006,” Xinhua, 06 March, 2006

GCK (2008). Website of the Government of Central Kalimantan, available at: http://www.kalteng.go.id/INDO/Kebun_investor.htm

Gibbs, H., (2008) Carbon payback times for crop-based biofuel expansion in the tropics: the effects of changing yield and technology. Environmental Research Letter. 3, 10pp

Glor, R.E. et al. (2001) Lizard diversity and agricultural disturbance in a Caribbean forest landscape. Biodiversity and Conservation 10, 711-723

Goldammer JG, Mutch RW (2001) Global forest fire assessment 1990–2000. FAO, pp 1–495.

Grassman, L.I., Tewes, M.E., N.J.Silvy (2005). Ranging, habitat use and activity patterns of binturong Arctictis binturong and yellow-throated marten Martes flavigula in north-central Thailand. Wildlife Biology 11:1.

Greenpeace (2004) Tanjung Puting National Park Under Siege.

Guerin, B. (2007) A who's who of Indonesian biofuel. Asian Times, 22 May 2007. http://www.atimes.com/atimes/Southeast_Asia/IE22Ae02.html

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.

Hairiah, K., Sitompul, S., Noordwijk, M., & Palm, C. (2001). Methods for sampling carbon stocks above and below ground. Bogor: International Center for Agroforostry Research (ICRAF).

Hansen, M. S. (2008). Humid tropical forest clearing from 2000 to 2005 quantified using multi-temporal and multi-resolution remotely sensed data. PNAS, 27 (105).

Hardiono, M. (2006). Satellite interpretation of forest cover in Ulu Masen. Banda Aceh: Fauna Flora International (unpublished report).

Harris, N., Petrova, S., & Brown, S. (2009). Preliminary Baseline CO2 Emission Estimates for the PT Rimba Raya Conservation Project. Arlington, VA: Winrock International.

Harrison, R. D. (2001) Drought and the consequences of El Niño in Borneo: a case study of figs. Population Ecology 43:63-75

Hassall, M. et al. (2006) Biodiversity and abundance of terrestrial isopods along a gradient of disturbance in Sabah, East Malaysia. European Journal of Soil Biology 42, S197-S207

HCV Toolkit (2008). Konsorsium Revisi Toolkit Indonesia. 2008. Panduan Identifikasi Kawasan Bernilai Konservasi Tinggi di Indonesia, Bogor.

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

Hotelling, H., (1931). The economics of exhaustive resources, Journal of Political Economy, 39, 137-175.

Hutson A. et al. (2001) Microchiropteran bats – global status survey and conservation action plan. IUCN Switzerland.

ICCI (2006). Tulus Tambunan. Indonesian Crude Palm Oil: Production, Export Performance and Competitiveness. Indonesian Chamber of Commerce and Industry, September 2006: p.

3. http://www.kadin-indonesia.or.id/en/doc/opini/Indonesian_Crude_Palm_Oil_Production_Export_Performance_And_Competitiveness.pdf

Ickes, K. et al. (2005) Impacts of nest construction by native pigs (Sus scrofa) on lowland Malaysian rain forest saplings. Ecology 86, 1540-1547

IPCC 2007. Working Group II Report “Impacts, Adaptation, Vulnerability”.

Iskandar, D.T. 2000.Turtles & Crocodiles of Insular Southeast Asia & New Guinea. Department of Biology, Institute of Technology, Bandung, Indonesia.

Jakarta Post, Feb. 13, 2009. Government to allow peatland plantations.

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.

Kapuas (2008). 763.556 Warga Miskin Dapat Jaminan Kesehatan. Accessed at <http://www.kapuas.net/content/view/258/1/> on 1 May 2009.

Kawanishi, K. and M.E. Sunquist (2004). Conservation status of tigers in primary rainforest of Peninsular Malaysia. Biological Conservation 120, pp.329-344.

Ketterings, Q., Coe, R., van Noordwijk, M., Ambagau, Y., & Palm, C. (2001). Reducing uncertainty in the use of allometric biomass equations for predicting above-ground tree biomass in mixed secondary forests. Forest Ecology and Management, 146, 199-209.

Koh, L.P. (2008) Can oil palm plantations be made more hospitable for forest butterflies and birds? Journal of Applied Ecology 45, 1002-1009

Lambert F. R. (1992) The consequences of selective logging for Bornean lowland forest birds. Philosophical Transactions of the Royal Society of London Series B 335, 443-457.

Lambert F. R. & Woodcock M. (1996) Pittas, Broadbills and Asities. Pica Press, Sussex, UK.

Lane D. et al. (2006) Dramatic decline in bat species richness in Singapore, with implications for Southeast Asia. Biological Conservation 131, 584-593.

Langner, Andreas, Jukka Miettinen & Florian Siegert (2006), “Remote Sensing as a Tool for Land Use Change, Fire and Illegal Logging Monitoring as well as Peatland Restoration

Planning in Southeast Asia," available at http://www.restorpeat.alterra.wur.nl/download/Andreas%20Langner.pdf.

Laurance WF (2003) Slow burn: the insidious effects of surface fires on tropical forests. Trends Ecol Evol 18:209–212.

Liow, L.H. et al. (2001) Bee diversity along a disturbance gradient in tropical lowland forests of south-east Asia. Journal of Applied Ecology 38, 180-192.

Loetsch, F., & Haller, K. (1964). Forest Inventory (Vol. I). Munchen: BLV-Verlags Gese Llschaft.

MacDicken, K. (1997). A guide to monitoring carbon storage in forestryand agroforestry projects. Washington, DC: Winrock.

MacKinnon, K., G. Hatta, H. Halim, A. Mangalik (1996). The Ecology of Kalimantan: Indonesian Borneo. The Ecology of Indonesia Series, Volume III. Dalhousie University, Periplus Editions (HK) Ltd., Singapore.

Maddox, T. et al. (2007) The conservation of tigers and other wildlife in oil palm plantations, Zoological Society of London

Madge S. & McGowan P. (2002) Pheasants, Partridges and Grouse. Christopher Helm, London.

Malhi, Y. e. (2004). The above-ground coarse wood productivity of 104 Neotropical plots. Global Climate Biology, 30, 563-575.

Mansur, M. (2002). Nepenthes: Kantong semar yang unik. Penebar Swadaya, Depok, Indonesia.

Meijaard E., Sheil D., Nasi R., Augeri D., Rosenbaum B., Iskandar D., Setyawati T., Lammertink M., Rachmatika I., Wong A., Soehartono T., Stanley S. & O'Brien T. (2005) Life After Logging: Reconciling Wildlife Conservation and Production Forestry in Indonesian Borneo. CIFOR, WCS and UNESCO, Bogor, Indonesia.

Mitchell, T., & Jones, P. (2005). An improved method of constructing a database of monthly climate observations and associated high-resolution grids. International Journal of Climatology, 25, 693-712.

Ministry of Forestry. 2004. Peraturan Menteri Kehutanan No. P.14 Tahun 2004 tentang Tata Cara Aforestasi dan Reforestasi Dalam Kerangka Mekanisme Pembangunan Bersih.

[Minister of Forestry Regulation No. P.14/2004 concerning rules and procedures for implementation of A/R CDM.] Jakarta, Indonesia.

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

NASA, accessed January 15, 2011 http://www.glcf.umd.edu/data/paraguay/description.shtml.

Nash S. V. & Nash A. D. (1987) An annotated checklist of the birds of Tanjung Putting National Park, Central Kalimantan. Kukila 3 (3-4): 93-116.

Nekaris, K.A.I., G.V. Blackham, V.Nijman (2008). Conservation implications of low encounter rates of five nocturnal primate species (Nycticebus spp.) in Asia. Biodiversity Conservation 17:733-747.

Niklas, K., & Spatz, H. (2006). Allometric theory and the mechanical stability of large trees: proof and conjecture. American Journal of Botany (93), 824-828.

Ng, T.P. and S. Ibrahim (2001). Common trees in peat swamp forests of Penninsular Malaysia. Forest Research Institute Malaysia, Kuala Lumpur, Malaysia.

Nicolas, Marc V.J. and Grant S. Beebe, (1999) Fire Management in the Logging Concessions and Plantation Forests of Indonesia.

Nishimua, T. B., E. Suzuki, T. Kohyama and S. Tsuyuzaki. 2007. Mortality and Growth of Trees in Peat-swamp and Heath Forests in Central Kalimantan After Severe Drought. Plant Ecology 188 (2):165-177.

Noerdjito, M. and I. Maryanto (2007). Jenis-jenis hayati yang dilindungi perundang-undangan Indonesia. LIPI Press, Cibinong, Indonesia.

O'Brien, T.G., M.Kinnaird, H.T.Wibisono (2003). Crouching tigers, hidden prey: Sumatran tiger and prey populations in a tropical forest landscape. Animal Conservation 6, pp.131-139.

Orangutan Foundation International (2008). Seruyan Forest Analysis – Working Report, December 2008.

Othman, J., (2003). Linking Agricultural Trade, Land Demand and Environmental Externalities: Case of Oil Palm in Southeast Asia. ASEAN Economic Bulletin. 20 (3), 244-55.

Page, S., (2009) New Data Analysis Conclusive About Release of CO2 When Natural Swamp Forest is Converted to Oil Palm Plantation. Carbopeat. Retrieved September, 17 2009 from the Carbopeat website: http://www.geog.le.ac.uk/carbopeat/press/pr2.html

Page, S. E., Siegert, F., Rieley, J.O.,Boehm, H.V., Jayak, A., and Limink, S. (2002). "The amount of carbon released from peat and forest fires in Indonesia during 1997." Nature 420: 61-65.

Page, S. E., Rieley, J.O., Wust, R. "Peatlands: Evolution and Records of Environmental and Climate Changes." Development in Earth Surface Processes.

Page, S.E., J.O. Rieley, O.W. Shotyk, D. Weiss. Interdependence of peat

and vegetation in a tropical peat swamp forest. Philosophical Transactions: Biological Sciences, Vol. 354, No.1391, Changes and Disturbance in Tropical Rainforest in South-East Asia.

Page, SE, JO Rieley, H-DV Boehm, F. Siegert, N. Muhamad. 2000. Impact of the 1997 fires on the peatlands of Central Kalimantan, Indonesia. In: Sustaining our Peatlands. Proceedings of the 11th International Peat Congress, 06-12.08.2000, Quebec (eds Rochefort L, Daigle J-Y), pp. 962-970. Canadian Society for Peat and Peatlands, Edmonton.

Palace, M., Keller, G., Asner, G., Hagen, S., & Braswell, B. (2008). Amazon Forest Structure from IKONOS satellite data and the automated characterization of forest canopy properties. Biotropica, 40 (2), 141-150.

Paoli, G.D., L.M. Curran and J.W.F. Slik (2008). Soil nutrients affect spatial patterns of aboveground biomass and emergent tree density in southwestern Borneo. Oecologia 155:287-299.

Peh, K.S.H. et al. (2006) Conservation value of degraded habitats for forest birds in southern Peninsular Malaysia. Diversity and Distributions 12, 572-581

Parish, F. 2008. Overview on Peat, Biodiversity, Climate Change and

Fire. Global Environment Centre.

Permerintah Daerah Kabupaten Seruyan (2004). Paparan Bupati Seruyan Tahun 2004. Accessed at <http://www.kalteng.go.id/INDO/kabupaten_seruyan.htm> on 1 May 2008.

Peterson, R. (1982). Sampling. In Methods of soil analysis (Vol. 9). Madison, Wisconsin: Agronomy Monograph ASA-SSSA.

Potter, L. (2009) The oil palm question in Borneo. In Reflections on the Heart of Borneo (Persoon, G., and Osseweijer, M., eds), Tropenbos International (in press)

Proctor, J. (1999) Heath forests and acid soils. Botanical Journal of Scotland 51:1-14.

Putz, F., Zuidema, P., Pinard, M., Boot, R., Sayer, J., Sheil, D., et al. (2008). Improved tropical forest managment for carbon retention.

Rajaratnam, R. et al. (2007) Diet and habitat selection of the leopard cat (Prionailurus bengalensis borneoensis) in an agricultural landscape in Sabah, Malaysian Borneo. Journal of Tropical Ecology 23, 209-217

Reyes, G., Brown, S., Chapman, J., & Lugo. (1992). Wood densities of tropical tree species. Southern Forest Experiment Station. New Orleans: USDA Forest Service.

Rhee, S. 2000. De Facto Decentralization during a Period of Transition in East Kalimantan. Asia Pacific Community Forestry Newsletter 13 (2): 34-40.

Rieley, J., (2009). New Data Analysis Conclusive About Release of CO2 When Natural Swamp Forest is Converted to Oil Palm Plantation. Carbopeat. Retrieved September, 17 2009 from the Carbopeat website: http://www.geog.le.ac.uk/carbopeat/press/pr2.html

Rieley, J. O., Page, S. E., and Shepherd, P. A. (1997). "Tropical Bog Forests of South East Asia," in: Conserving Peatlands. L. Parkyn, Stoneman, R. E. and Ingram, H. A. P., Wallingford., CAB International: 35-41.

Room, P.M. (1975) Diversity and organization of the ground foraging ant faunas of forest, grassland and tree crops in Papua New Guinea. Australian Journal of Zoology 23, 71

Saatchi, S., Houghton, R., Dos Santos, C., & Soares, J. (2007). Distribution of aboveground live biomass in the Amazon basin. Global Change Biology, 13, 816-837.

Sakai, S., R. D. Harrison, K. Momose, K. Kuraji, H. Nagamasu, T. Yasunari, L. Chong and T. Nakashizuka. 2006. Irregular droughts trigger mass flowering in aseasonal tropical forests in asia. American Journal of Botany. 93:1134-1139.

Samalca, I. (2008). Estimation of forest biomass and its error: a case in Kalimantan, Indonesia. International Institute for Geo-Information Science and Earth Observation. Enschede, The Netherlands: Msc Thesis.

Santosa, Y., A.P. Kartono and A. Muin (2008). Pendugaan potensi dan studi keanekaragaman jenis vegetasi di calon lokasi pelepasan-liaran orang utan di Kabupaten Seruyan, Propinsi Kalimantan Tengah. Institute Pertanian Bogor, Bogor, Indonesia.

Scott, D. M., E. Gemita, and T. M. Maddox (2004). Small cats in human modified landscapes in Sumatra. Cat News 40:23-25.

Searchinger, T., (2008). Use of U.S. cropland for biofuels increases greenhouse gases through emissions from land use change. Science.

Sheldon F. H. (1987) Habitat preferences of the Hook-billed Bulbul

Setornis criniger and the White-throated Babbler Malacopteron albogulare in Borneo. Forktail 3, 17-25.

Shine, R. et al. (1999) Ecological attributes of two commercially-harvested python species in northern Sumatra. Journal of Herpetology 33, 249-257

Siegert, F., (2009) New Data Analysis Conclusive About Release of CO2

When Natural Swamp Forest is Converted to Oil Palm Plantation. Carbopeat. Retrieved September, 17 2009 from the Carbopeat website: http://www.geog.le.ac.uk/carbopeat/press/pr2.html

Simamora, Adianto P., (2008), "Government more bark than bite," The Jakarta Post, December 22, 2008.

Simamora, Adianto P., (2009b), "Govt to allow peatland plantations," The Jakarta Post, February 13, 2009.

Simamora, Adianto P., (2009a), "Regions seek forest conversions," The Jakarta Post, February 2, 2009.

Slaymaker, D. 2003. Using georeferenced large-scale aerial

videography as a surrogate for ground validation data. In: Wulder, M.A. and S.E. Franklin (eds.), 2003. Remote Sensing of Forest Environments: Concepts and Case Studies. Kluwer, ISBN 1-4020-7405-0, pps. 469-488. http://www.wkap.nl/prod/b/1-4020-7405-0.

Slik, J.W.F., N. Raes, S.I. Aiba, F.Q. Brearley, C.H. Cannon, E. Meijaard, H. Nagamasu, R. Nilus, G.D. Paoli, A.D. Poulsen, D. Sheil, E. Suzuki, J.L.C.H. van Valkenburg, C.O. Webb, P.

Smith, L.B., B..Galdikas, N. Briggs. 2006. Addressing Border Issues

Tanjung Puting National Park, Central Kalimantan, Indonesia. Presented at ESRI GIS User Conference San Diego, CA July 9-14, 2006.

Stanley S. A. (2008) Preliminary Carbon Estimate in the Proposed Extension Area of Tanjung Puting National Park, Central Kalimantan, Indonesia. Draft Report to EnVision Corp.

Stanley, S. Leighton, M. and Bathgate, J. (2005). "High Conservation Value Forest Assessment of PT Adindo." The Nature Conservancy and APRIL Pulp and Paper Report. East Kalimantan, Indonesia.

Struebig, M.J. et al. (2008) Conservation value of forest fragments to palaeotropical bats. Biological Conservation 141. 2112-2126

Struebig M. et al. (2009) Bats of Borneo: diversity, distributions and representation in protected areas. Biodiversity and Conservation.[Special Issue: Biodiversity Crisis on Tropical Islands]. In Press.

Susilo, H.D. (1997). The Tanjung Putting National Park and Biosphere Reserve, Indonesia. Working Papers No. 22. South-South Co-operation Programme on Environmentally Sound Socio-economic Development in the Humid Tropics, UNESCO, France.

Tacconi L (2003) Fires in Indonesia: causes, costs and policy \implications. CIFOR, pp 1–34

Tanpipat V., Honda K., Nuchaiya P. 2009. MODIS Hotspot Validation over Thailand. Remote Sensing, 1,1043-1054.

T. C. Whitmore 1984. Tropical rain forests of the Far East. (2nd edition).

Thomas, C. D., A. Cameron, R. E. Green, M. Bakkenes, L. J. Beaumont, Y.C. Collingham, B. F. N. Erasmus, M. F. de Siqueira, A. Grainger, L. Hannah, L. Hughes, B. Huntley, A. S. van Jaarsveld1, G. F. Midgley, L. Miles, M. A. Ortega-Huerta, A. T. Peterson, O. L. Phillips, S. E. Williams. (2004). Extinction risk from climate change. Nature 47: 145

Timmermann, A., Oberhuber, J., Bacher, A., Esch, M., Latif, M., Roeckner, E.: 1999, 'Increased El Niño frequency in a climate model forced by future greenhouse warming', Nature 398, 694 – 697

Tucker, C.J. and J.R. Townshend. 2000. Strategies for tropical forest deforestation assessment using satellite data. International Journal of Remote Sensing 21:1461-1472.

Turner, E.C. et al. (2008) Oil palm research in context: identifying the need for biodiversity assessment. PLoS ONE 3, e1572 NDP (2007). Human Development Report 2007/2008, Fighting Climate Change: Human Solidarity in a Divided World. NYC, New York.

UNEP 2007. Last Stand of the Orangutan.USDA (2007), US Department of Agriculture Commodity Intelligence Report, 31 December 2007 an Schaik, J. Sugardjito, T. Simorangkir, K. Traylor-Holzer, M. Doughty,

J. Supriatna, R. Dennis, M. Gumal, C. D. Knott and I. Singleton. (2008) "Distribution and conservation status of the orang-utan (Pongo spp.) on Borneo and Sumatra: how many remain?". Fauna & Flora International, Oryx, 42(3), 329–339.

Wayunto, S., S. Ritung, and Subagjo H. (2004). "Maps of Area of Peatland distribution and carbon content in Kalimantan." Wetlands International – Indonesia Program & Wildlife Habitat Canada.

Wetlands International. 2004. Peatland distribution and carbon content in Kalimantan, 2000-2002. Book 1. First Edition 2004 © Wetlands International - Indonesia Programme, 2004. Bogor, Indonesia.

Wiens, F. (2002). Behavior and Ecology of Wild Slow Lorises (Nycticebus coucang): Social Organization, Infant Care System, and Diet. Dissertation presented to the Faculty of Biology, Chemistry and Geosciences of Bayreuth University in partial fulfillment of the requirements for the degree of Doctor of Natural Sciences. Bayreuth.

Wich, S. A., E. Meijaard, A. J. Marshall, S. Husson, M. Ancrenaz, R. C. Lacy, C. P. Wikramanayake, E., E. Dinerstein, C.L. Loucks et al. (2002). Terrestrial Ecoregions of the Indo-Pacific: a Conservation Assessment. Island Press, Washington, DC.

Wilkie and S. Wulffraat (2009). In review. Why lowland forst of Borneo have 60% higher aboveground biomass than the Amazon. Ecology Letters.

Wikipedia, Non-Renewable Resource. (2009). In Wikipedia, the free encyclopedia. Retrieved September 29, 2009, from http://en.wikipedia.org/wiki/Non-renewable_resource

Winjum et al. (1998). FAO 1995. FAO Yearbook: Forest products. FAO For. Serv. No. 28, FAO, Rome, 422 p.

Winrock 2008. Unpublished data logging gap assessment Mawas, Central Kalimantan (Logging gap data Mawas calculation sheet 23jun08-1.xls).

World Bank, (2006) Early Childhood Education and Development in Indonesia: An Investment for a Better Life. Washington, D.C.

World Bank (2006). Making the new Indonesia work for the poor: Overview. Jakarta, Indonesia.

Wösten, J.H.M., A.B. Ismail and A.L.M. Van Wijk (1997). Peat subsidence and its practical implications: a case study in Malaysia. Geoderma 78: 25-36

Wösten, J.H.M. and H.P. Ritzema (2001). Land and water management options for peatland development in Sarawak, Malaysia. International Peat Journal 11: 59-66.

WWF-Indonesia, (2008) "Ecotourism, A Harmony Between Economic and Conservation," Press Release, Aug. 8, 2008, available at http://wwf.or.id/index.php?fuseaction=press.detail&language=e&id=PRS1218179948