

# Community Forest Ecosystem Services (CFES)

## INDONESIA

Fauna & Flora International – Indonesia Programme

# PROJECT SUMMARY

Location	HD Laman Satong	HD Rio Kemunyang	HKm Aik Bual
Village, district, province	Laman Satong, Ketapang, West Kalimantan	Durian Rambun, Merangin, Jambi	Aik Bual, Central Lombok, West Nusa Tenggara
Tenure status Area (ha_	Village Forest/HD 1070 ha	Village Forest/HD 3616 ha	Community Forest/HKm 100 ha
Intervention	Avoided Deforestation	Avoided Deforestation	Ecosystem Rehabilitation
Baseline	Planned Deforestation	Unplanned Deforestation	Non Forest
Activities	Conservation of natural forest Sustainable livelihood activities		Improving agroforestry system
Carbon Stock (tonnes C/ha)	97.88	218.74	77.63
Baseline	Land clearing 1,000 ha per annum	Deforestation Rate 1.99% per annum	Tree density 110 trees per hectare
Project Scenario	Deforestation rate 0.3% per annum	Deforestation rate 0.5% per annum	Tree density 400 trees per hectare
Project Benefit (tonnes CO <sub>2</sub> e/year)	12,590	25,697	4,317

# Avoided Planned Deforestation

*Hutan Desa* Laman Satong  
Ketapang District, West Kalimantan

# Carbon Stock

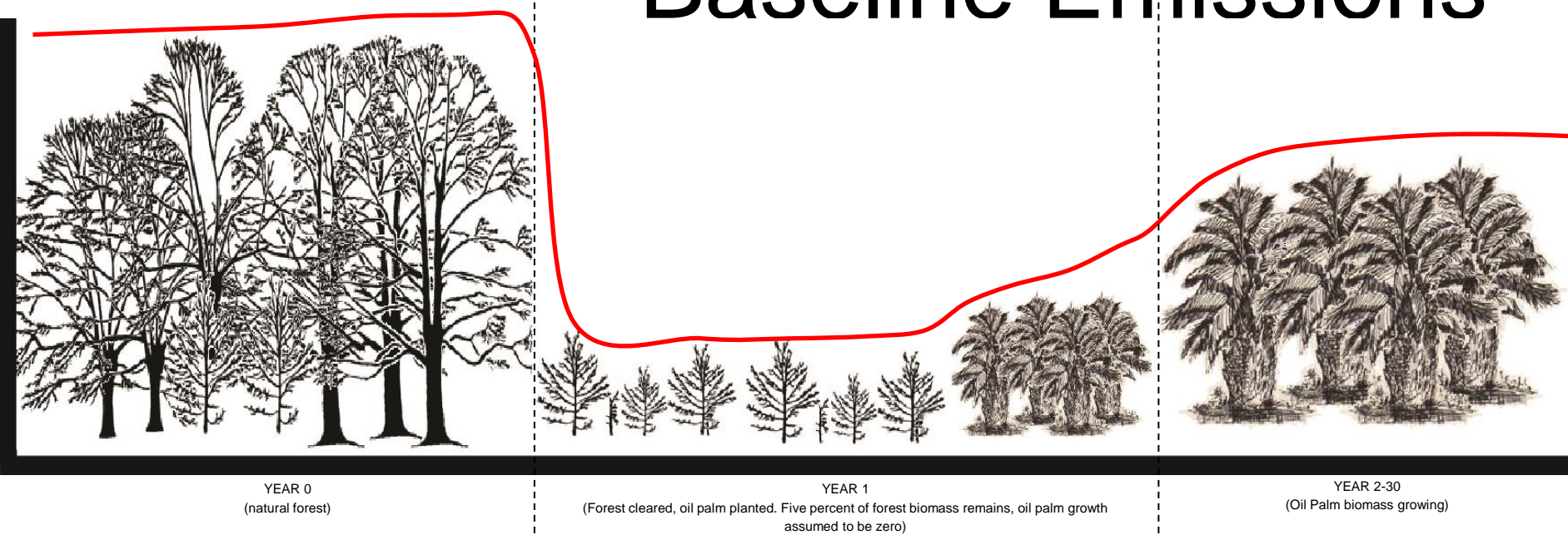


Land Cover Classes	Above Ground (tonnes/ha)		Below Ground (tonnes/ha)	
	Mean	Std Deviation	Mean	Std Deviation
Dense Forest	102.79	12.68	38.03	4.69
Medium Forest	69.46	12.04	25.70	4.45
Sparse Forest	51.98	0.11	19.23	0.04

**Protection Zone (tonnes C/ha) 97.88**

**Rehabilitation Zone (tonnes C/ha) 34.30**

# Baseline Emissions



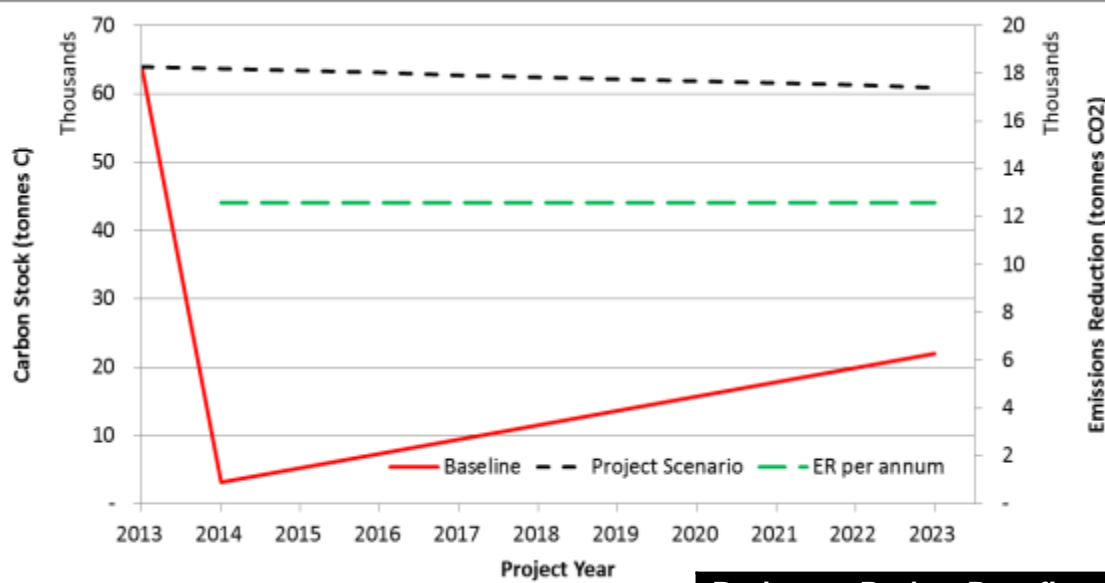
Project Year	Cummulative Carbon Stock (tonnes C)		
	Forest	Palm Oil	Baseline
0	63,978.13		63,978.13
1	3,198.91	-	3,198.91
2	3,198.91	6,439.65	9,638.56
3	3,198.91	7,980.08	11,178.99
4	3,198.91	9,520.51	12,719.41
5	3,198.91	11,060.94	14,259.84
6	3,198.91	12,601.36	15,800.27
7	3,198.91	14,141.79	17,340.70
8	3,198.91	15,682.22	18,881.13
9	3,198.91	17,222.65	20,421.55
10	3,198.91	18,763.08	21,961.98

## Planned Deforestation

# Project Scenario (Avoided Planned Deforestation)

Project	Carbon Stock (tonnes C)	
Year	Baseline	Project Scenario
<b>0</b>	63,978.13	63,978.13
<b>1</b>	3,198.91	63,670.16
<b>2</b>	9,638.56	63,363.22
<b>3</b>	11,178.99	63,057.30
<b>4</b>	12,719.41	62,752.40
<b>5</b>	14,259.84	62,448.52
<b>6</b>	15,800.27	62,145.65
<b>7</b>	17,340.70	61,843.79
<b>8</b>	18,881.13	61,542.94
<b>9</b>	20,421.55	61,243.09
<b>10</b>	21,961.98	60,944.23

# Project Benefit



Project Year	Project Benefit (tonnes carbon)	Estimated ERs (tonnes CO2e)	Estimated ERs After 12% Buffer Deduction (tonnes CO2e)
0			-
1	60,471.26	221,929.51	195,297.97
2	(6,746.59)	(24,760.00)	(21,788.80)
3	(1,846.35)	(6,776.09)	(5,962.96)
4	(1,845.33)	(6,772.35)	(5,959.67)
5	(1,844.31)	(6,768.62)	(5,956.39)
6	(1,843.30)	(6,764.90)	(5,953.11)
7	(1,842.29)	(6,761.20)	(5,949.85)
8	(1,841.28)	(6,757.50)	(5,946.60)
9	(1,840.28)	(6,753.82)	(5,943.37)
10	(1,839.28)	(6,750.16)	(5,940.14)
<b>TOTAL</b>			<b>125,897.08</b>
<b>Per annum</b>			<b>12,589.71</b>

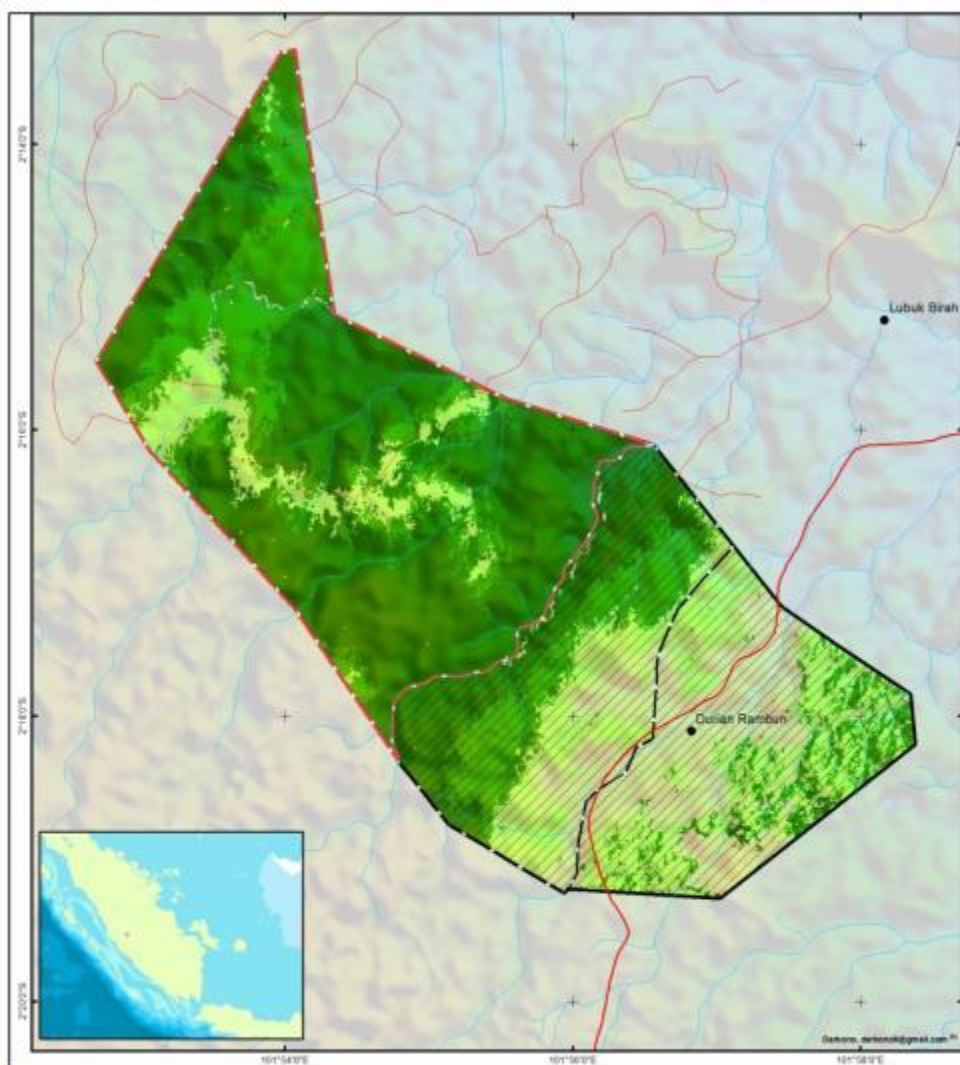
**Avoided  
Planned Deforestation**

# Avoided Unplanned Deforestation

*Hutan Desa* Rio Kemunyang  
Durian Rambun, Merangin District,  
Jambi

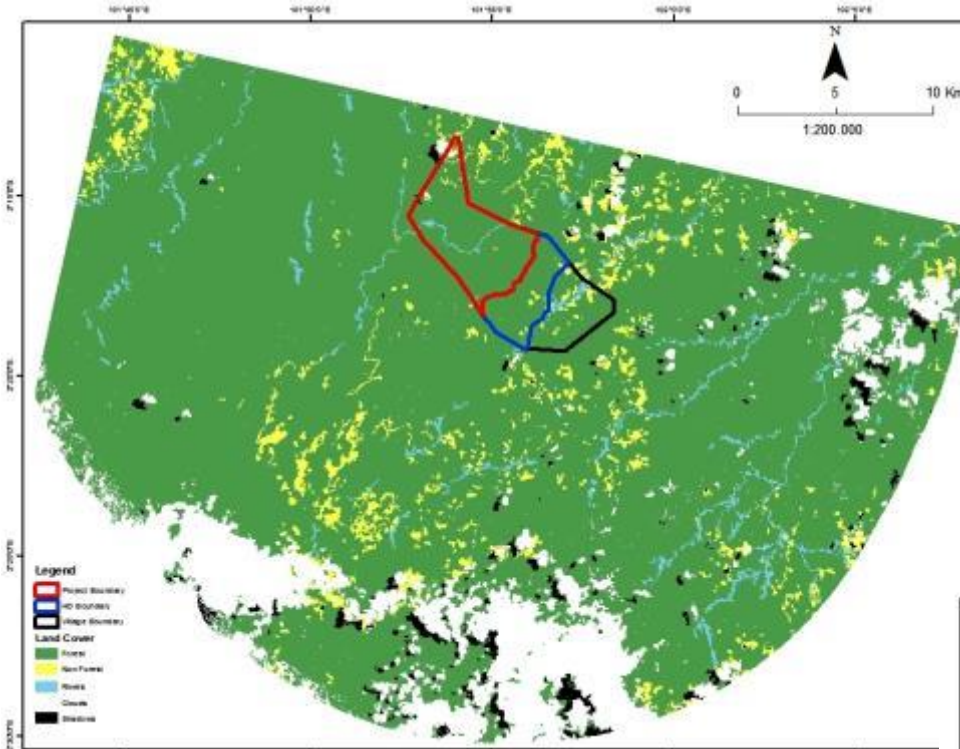


# Carbon Stock

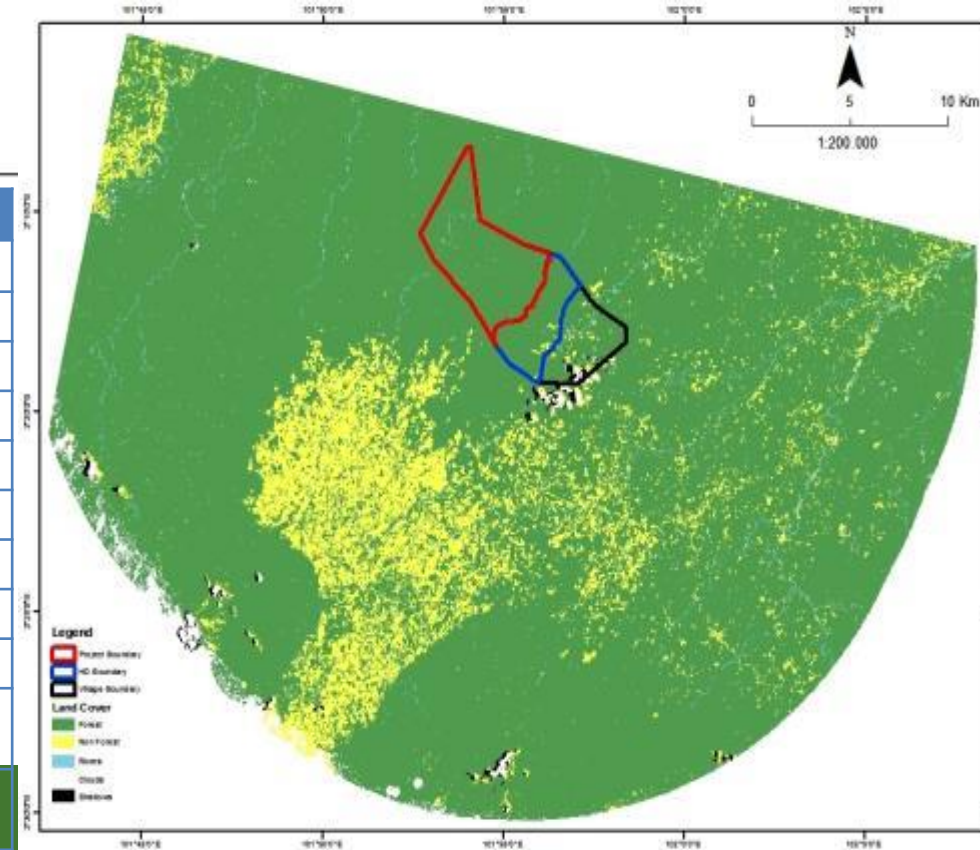


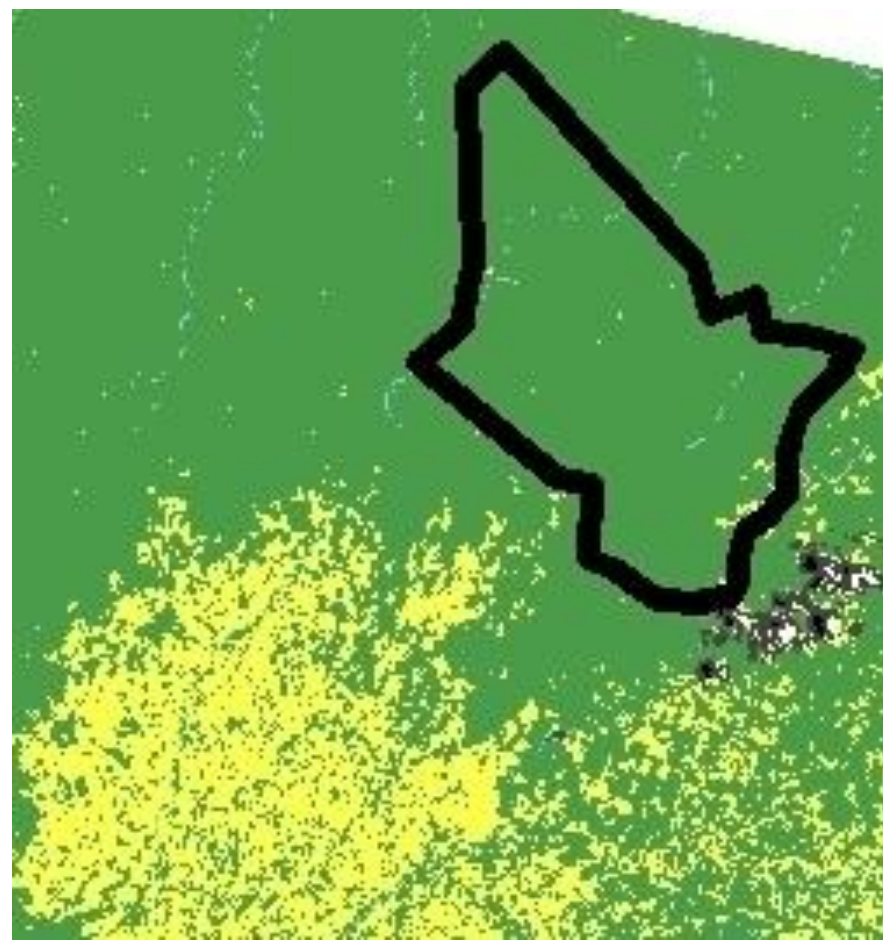
Land Cover Classes	Above Ground (tonnes/ha)		Below Ground (tonnes/ha)	
	Mean	Std Deviation	Mean	Std Deviation
Dense Forest	193.48	21.41	71.59	7.92
Medium Forest	101.67	6.17	37.62	2.28
Sparse Forest	70.55	11.93	26.10	4.41
<b>Protection Zone (tonnes C/ha)</b>			<b>218.74</b>	
<b>Rehabilitation Zone (tonnes C/ha)</b>			<b>26.64</b>	

# Baseline (Deforestation Rate)



LULC	2000	2011
Dense Forest	39,914.34	14,285.86
Medium Forest	15,855.55	16,030.52
Sparse Forest	17,227.38	26,651.58
Agriculture	10,332.44	14,506.57
Shrubs	19,781.16	24,525.11
Open Area	15,005.58	22,116.82
Forest land	72,997.26	56,967.96
Non Forest land	45,119.19	61,148.49
Deforestation (ha)	<b>16,029.31</b>	
Deforestation (ha/year)	<b>1,457.21</b>	
<b>Annual Deforestation Rate (%)</b>		<b>1.996</b>





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<b>NON FOREST LAND</b>	<b>45,119.19</b>	<b>61,148.49</b>

<b>Deforestation (ha)</b>	<b>16,029.31</b>
<b>Deforestation (ha/year)</b>	<b>1,457.21</b>
<b>Annual Deforestation Rate (%)</b>	<b>1.996</b>

# Baseline Emissions

Project	Forest Area	Baseline Carbon Stock	Project	Forest Area	Baseline Carbon Stock
Year	(ha)	(tonnes C)	Year	(ha)	(tonnes C)
0	3,616	790,924.86			
1	3,544	775,185.46	16	2,621	573,404.97
2	3,473	759,759.27	17	2,569	561,994.21
3	3,404	744,640.06	18	2,518	550,810.53
4	3,337	729,821.72	19	2,468	539,849.40
5	3,270	715,298.27	20	2,419	529,106.40
6	3,205	701,063.83	21	2,371	518,577.18
7	3,141	687,112.66	22	2,324	508,257.49
8	3,079	673,439.12	23	2,277	498,143.17
9	3,018	660,037.68	24	2,232	488,230.12
10	2,957	646,902.93	25	2,188	478,514.34
11	2,899	634,029.56	26	2,144	468,991.91
12	2,841	621,412.38	27	2,101	459,658.97
13	2,784	609,046.27	28	2,060	450,511.75
14	2,729	596,926.25	29	2,019	441,546.57
15	2,675	585,047.42	30	1,978	432,759.79
		<b>Total Loss in 30 Years</b>		<b>1,637</b>	<b>358,165</b>
		<b>Per Annum Loss</b>		<b>54.6</b>	<b>11,939</b>

## Unplanned Deforestation

## (Avoided Unplanned Deforestation)

Project	Cumulative Area (ha)		Cumulative Carbon Stock (tonnes)		Project	Cumulative Area (ha)		Cumulative Carbon Stock (tonnes)	
Year	Baseline	Project Scenario	Baseline	Project Scenario	Year	Baseline	Project Scenario	Baseline	Project Scenario
0	3,616	3,616	790,924.86	790,924.86	16	2,621	3,339	573,404.97	730,262.68
1	3,544	3,598	775,185.46	786,990.01	17	2,569	3,322	561,994.21	726,629.63
2	3,473	3,580	759,759.27	783,074.74	18	2,518	3,305	550,810.53	723,014.64
3	3,404	3,562	744,640.06	779,178.94	19	2,468	3,289	539,849.40	719,417.65
4	3,337	3,544	729,821.72	775,302.52	20	2,419	3,273	529,106.40	715,838.54
5	3,270	3,527	715,298.27	771,445.39	21	2,371	3,256	518,577.18	712,277.25
6	3,205	3,509	701,063.83	767,607.45	22	2,324	3,240	508,257.49	708,733.67
7	3,141	3,492	687,112.66	763,788.61	23	2,277	3,224	498,143.17	705,207.72
8	3,079	3,474	673,439.12	759,988.76	24	2,232	3,208	488,230.12	701,699.31
9	3,018	3,457	660,037.68	756,207.81	25	2,188	3,192	478,514.34	698,208.35
10	2,957	3,440	646,902.93	752,445.68	26	2,144	3,176	468,991.91	694,734.77
11	2,899	3,423	634,029.56	748,702.26	27	2,101	3,160	459,658.97	691,278.46
12	2,841	3,406	621,412.38	744,977.47	28	2,060	3,145	450,511.75	687,839.35
13	2,784	3,389	609,046.27	741,271.21	29	2,019	3,129	441,546.57	684,417.35
14	2,729	3,372	596,926.25	737,583.38	30	1,978	3,113	432,759.79	681,012.38
15	2,675	3,355	585,047.42	733,913.90					

### Project Scenario:

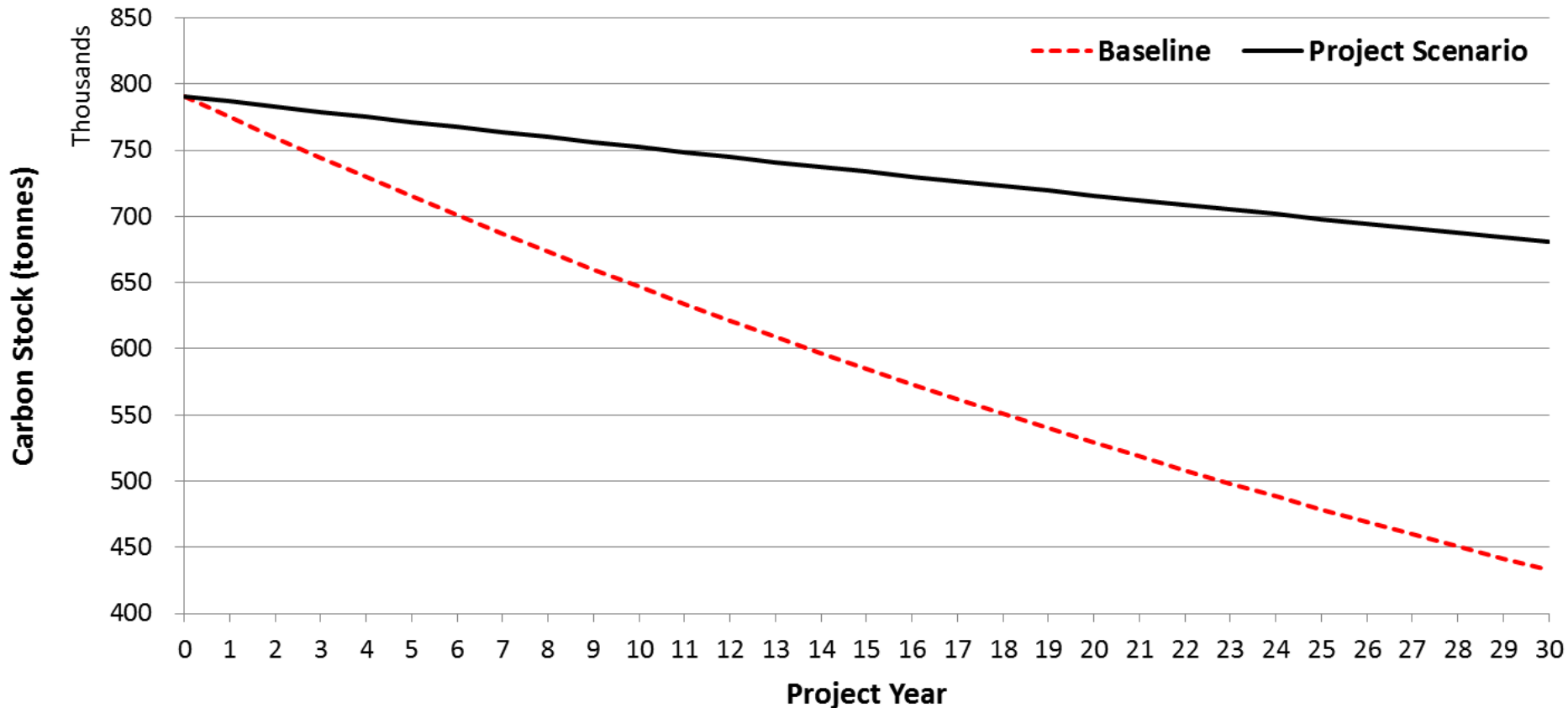
As much as 75% of carbon stock in natural forest can be protected in 30 years or 0.5% forest carbon will be lost each year

# Project Benefit

## (Avoided Unplanned Deforestation)

Project	Project Benefit	Estimated ERs	Estimated ERs After 14% Buffer	Project	Project Benefit	Estimated ERs	Estimated ERs After 14% Buffer
Year	(tonnes carbon)	(tonnes CO2e)	Deduction (tonnes CO2e)	Year	(tonnes carbon)	(tonnes CO2e)	Deduction (tonnes CO2e)
1	11,671	42,833	36,837	17	7,644	28,055	24,127
2	11,378	41,756	35,910	18	7,435	27,288	23,468
3	11,090	40,701	35,003	19	7,231	26,537	22,822
4	10,809	39,668	34,114	20	7,031	25,802	22,190
5	10,533	38,656	33,244	21	6,835	25,083	21,571
6	10,263	37,666	32,393	22	6,643	24,379	20,966
7	9,999	36,696	31,559	23	6,455	23,690	20,373
8	9,740	35,747	30,743	24	6,271	23,016	19,794
9	9,487	34,818	29,943	25	6,092	22,356	19,226
10	9,239	33,908	29,161	26	5,916	21,710	18,671
11	8,997	33,018	28,395	27	5,743	21,078	18,127
12	8,759	32,146	27,645	28	5,575	20,459	17,595
13	8,527	31,292	26,911	29	5,410	19,854	17,075
14	8,299	30,457	26,193	30	5,248	19,262	16,565
15	8,076	29,639	25,490	<b>EMISSIONS REDUCTION IN:</b>		<b>30 years</b>	<b>770,910.77</b>
16	7,858	28,838	24,801				

# Project Benefit (Avoided Unplanned Deforestation)

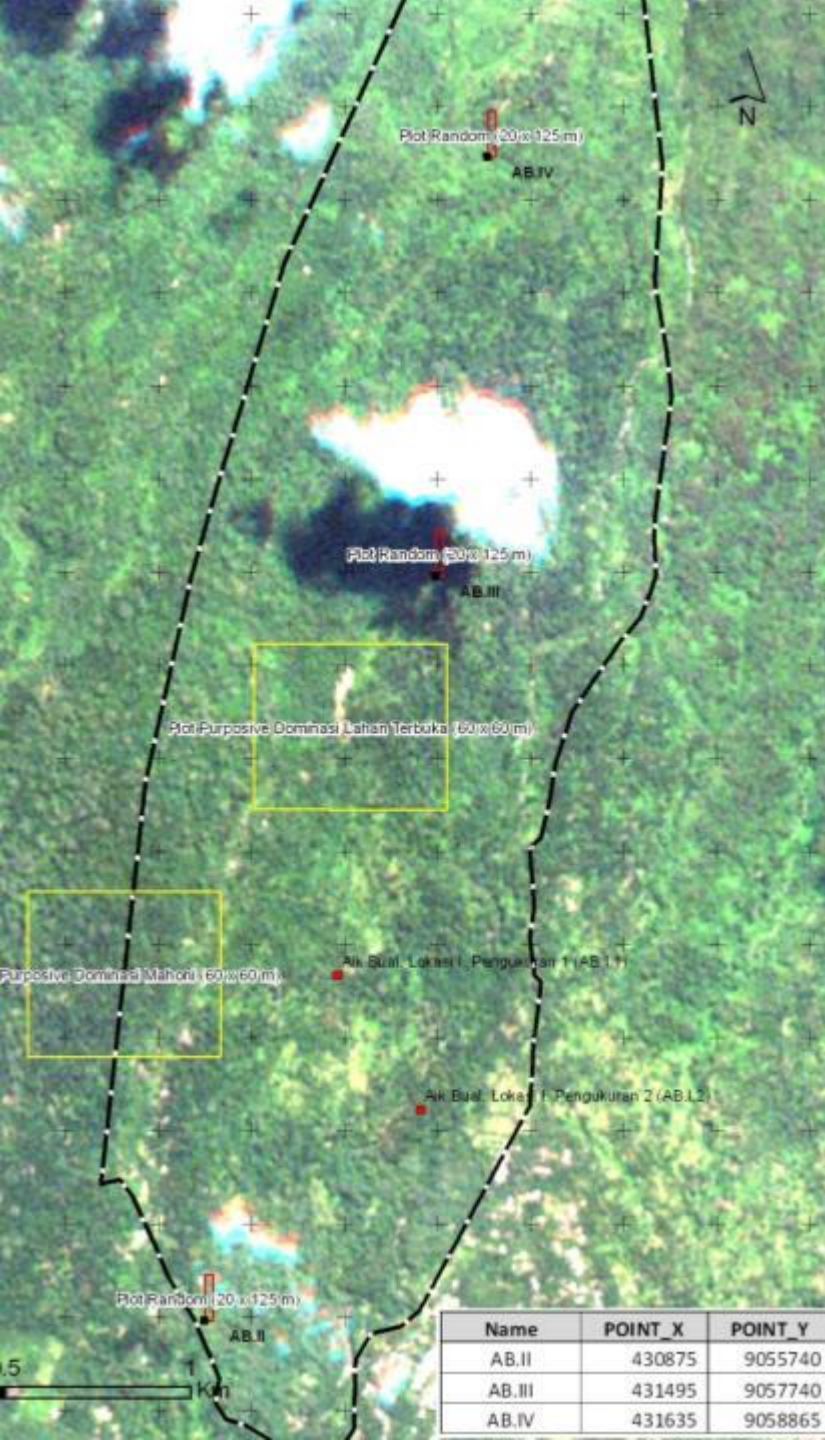


# Ecosystem Rehabilitation

*Hutan Kemasyarakatan Aik Bual*  
Central Lombok District, Lombok Island



# Carbon Stock



Plot Name	Dominant Species	Tree Density (trees/ha)	Total Carbon Stock (t C/ha)	Total SD
ABI.I	<i>Erythrina sp</i>	120	89.46	3.85
ABI.II	<i>Swietenia mahagoni</i>	132	214.45	3.15
	<i>Coffea robusta</i>	120	84.71	2.59
AB.III	<i>Swietenia mahagoni</i>	84	97.17	3.24
AB.IV	<i>Erythrina sp</i>	92	45.94	1.44
Purposive BareLand	<i>Swietenia mahagoni</i>	39	79.73	6.42
	<i>Swietenia mahagoni</i>	181	253.26	2.3

# Tree Growth Models

No	Jenis	Nama Lokal	N	Regression*	R2
1	Alleurites mollucana	Kemiri;	4	$y = 1.4964x + 28.276$	0.88
2	Annona muricata	Sirsak;	3	$y = 1.2761x + 2.4925$	0.98
3	Artocarpus heterophyllus	Nangka;	4	$y = 1.9936x + 5.0535$	0.96
4	Ceiba petandra	Randu;	5	$y = 2.7324x + 7.028$	0.87
5	Duabanga moluccana	Rajumas;	6	$y = 4.7392x + 0.1773$	0.85
6	Durio zibethinus	Durian;	5	$y = 1.6023x + 11.663$	0.98
7	Erythrina sp	Dadap;	5	$y = 0.9375x + 27.334$	0.95
8	Garcinia mangostana	Manggis;	6	$y = 0.4574x + 3.7272$	1.00
9	Lansium domesticum	Duku;	6	$y = 0.5063x + 7.7606$	0.88
10	Manilkara zapota	Sawo nila;	4	$y = 1.4006x + 2.7043$	0.99
11	Paraserianthes falcataria	Sengon;	4	$y = 2.2008x + 22.253$	0.94
12	Persea americana	Alpukat;	3	$y = 1.125x + 0.5417$	0.86
13	Psidium guajava	Jambu Batu;	3	$y = 2.07x + 2.86$	0.96
14	Swietenia mahagoni	Mahoni;	5	$y = 2.0695x + 14.816$	0.86
	*y is DBH, x is age		57		

# Carbon Stock

AB IV



**Carbon Stock:** 45.94 $\pm$ 1.44 tonnes C/ha  
**Tree Density:** 92 trees

AB I.II



**Carbon Stock:** 214.45 $\pm$ 3.15 tonnes C/ha  
**Tree Density:** 132 trees

# Baseline

## 110 trees/ha

Existing Tree Species	# Tree	%
<i>Artocarpus heterophyllus</i>	12	9%
<i>Ceiba petandra</i>	1	1%
<i>Coffea robusta</i>	15	11%
<i>Durio zibethinus</i>	2	1%
<i>Erythrina sp</i>	40	29%
<i>Paraserianthes falcataria</i>	9	7%
<i>Psidium guajava</i>	2	1%
<i>Swietenia mahagoni</i>	54	39%
<i>Theobroma cacao</i>	2	1%
<b>Total</b>	<b>137</b>	

Mean Carbon Stock (tonnes C/ha)	77.63
Mean SD Carbon Stock	2.08
Tree Density (trees/ha)	110
Carbon Increment (tonnes C/ha/year)	5.38

Year	Baseline (Tonnes/ha C)
1	77.63
2	83.00
3	88.38
4	93.76
5	99.14
6	104.52
7	109.90
8	115.28
9	120.65
10	126.03
11	131.41
12	136.79
13	142.17
14	147.55
15	152.92

# Project Scenario (A/R)

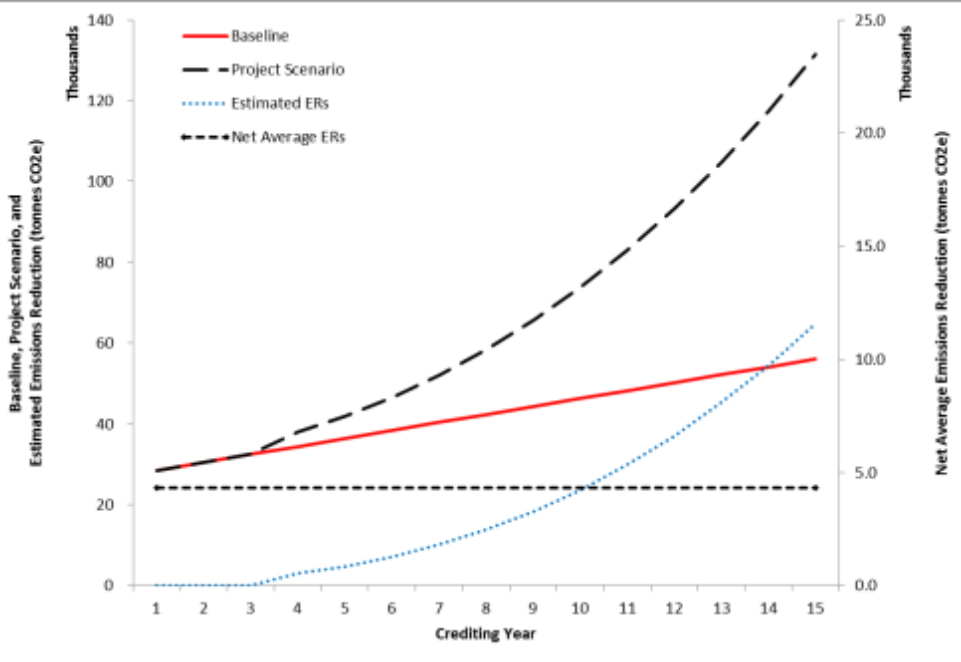
## 400 trees/ha

No	Planned Tree-planting Species	Tree	%	Tree Planting	Carbon Stock (Tonnes C/Ha)	
					In 15 years	Per year
1	Annonamuricata	40	10%	29	2.59	0.17
2	Duabanga moluccana	120	30%	87	172.16	11.48
3	Durio zibethinus	40	10%	29	13.71	0.91
4	Garcinia mangostana	80	20%	58	1.99	0.13
5	Lansium domesticum	40	10%	29	2.04	0.14
6	Manilkara zapota	40	10%	29	8.32	0.55
7	Persea americana	40	10%	29	4.37	0.29
<b>Total</b>		400		290	205.18	13.68

Mean Carbon Stock (tonnes C/ha)	91
Tree Density (trees/ha)	400
Planting Needed (trees/ha)	290
Project Area (ha)	100

Year	Carbon Increment (tonnes C/ha)	Project Scenario
1	0.00	77.63
2	0.00	83.00
3	0.00	88.38
4	9.72	103.48
5	14.97	114.11
6	22.37	126.89
7	31.87	141.76
8	43.65	158.93
9	57.91	178.57
10	74.83	200.86
11	94.58	225.99
12	117.34	254.12
13	143.25	285.42
14	172.48	320.02
15	205.18	358.10

# Project Benefit (A/R 100 ha)



Crediting Year	Cumulative Baseline CO2e (tonnes)	Cumulative Project Scenario CO2e (tonnes)	Estimated ERs (tonnes CO2e)	Estimated ERs After 14% Buffer Deduction (tonnes CO2e)	Net Average ER (tonnes CO2e)
1	28488.73	28488.73	0.00	-	4317.24
2	30462.63	30462.63	0.00	-	4317.24
3	32436.52	32436.52	0.00	-	4317.24
4	34410.42	37978.22	3567.80	3068.31	4317.24
5	36384.31	41876.56	5492.24	4723.33	4317.24
6	38358.21	46568.85	8210.64	7061.15	4317.24
7	40332.11	52027.52	11695.41	10058.05	4317.24
8	42306.00	58325.94	16019.94	13777.15	4317.24
9	44279.90	65533.68	21253.79	18278.26	4317.24
10	46253.79	73717.15	27463.36	23618.49	4317.24
11	48227.69	82940.05	34712.36	29852.63	4317.24
12	50201.59	93263.76	43062.17	37033.47	4317.24
13	52175.48	104747.60	52572.11	45212.02	4317.24
14	54149.38	117449.07	63299.69	54437.74	4317.24
15	56123.28	131424.06	75300.78	64758.67	4317.24

## Next steps:

- Result-based payment trials for Laman Satong & Durian Rambun (2014)
- Tree nursery and planting - 400 trees/ha (2014) in Aik Bual Lombok
- PDD submission & 3rd party audit
- ERPA/PES agreement, result based-incentive (from 2015)



**SNI**

Standar Nasional Indonesia