

Date	Update	Sheet of update
Apr-22	2014 mining activity data	"Activity Data" cell G6
Apr-22	carbon stocks maximum/minimum deleted degradation AD subtotal line	"CarbonStocks" rows 5 & 6
Apr-22	and total AD line	"Activity Data"
Apr-22	eliminated illegal logging emissions calculations from total	"Emissions" row 14 "Deforestation EFs" rows 25 & 26
Jun-22	revised GWPs to reflect AR5	"Activity Data" cell D8
Jun-22	corrected 2011 infrastructure AD	
Jun-22	Added accuracy assessment standard error for 2020 infrastructure and used as input to calculate SE for AD	"Activity Data" cells M59 & M34 <b>all "SimVoi..." sheets and "TREES ERs"</b>
Jun-22	<b>Monte Carlo analysis re-run</b>	
Aug-22	updated 2017 deforestation AA data	Activity Data, cell J51
Aug-22	updated 2011 infrastructure activity data	Activity Data, cell D8 <b>all "SimVoi..." sheets and "TREES ERs"</b>
Aug-22	<b>Monte Carlo analysis re-run</b>	
Sep-22	Corrected errors and re-ran MC for 2021	"SimVoi...2021" and "TREES ERs"
Feb-23	Added table to "TREES ERs" to show adjusted ERs reported for 2016-2020	"TREES ERs" "TREES ERs" "Activity Data" & "... (MC)" "Emissions" & "... (MC)" "Emission Reductions" & "... (MC)"
Aug-23	Added 2022 (file name change) deleted degradation AD subtotal line	"Activity Data (MC)" "SimVoi...2022"
Aug-23	and total AD line	"TREES ERs"
Aug-23	Monte Carlo analysis for 2022 Settlement data from RS accuracy assessment added to activity data to	
Sep-23	adjust uncertainty estimates	"Activity data" <b>"SimVoi.2021..." sheets and "TREES ERs"</b>
Sep-23	<b>Monte Carlo analysis re-run for 2021</b>	

corrected EF used for 2021&22 SC and  
Oct-23 fire "Emissions"  
all "SimVoi..." sheets and  
**Oct-23 Monte Carlo analysis re-run for 2022** "TREES ERs"

**Notes/rationale**

previous number was incorrect  
corrected maximum and minimum for all pools (note that these numbers are for reference only and so this update doesn't impact any other figures)  
because the units are varied (hectares, cubic meters, and kilometers) the totals are meaningless  
illegal logging is included in total logging volume, so including it in total was double counting; numbers were left for reference but no longer contribute to total degradation emissions

previous value used older IPCC AR  
previous number was incorrect

previously omitted

**Revised uncertainty estimates to account for above updates**

updated from the accuracy assessment estimated value 7,733 ha for gross deforestation rather than GFC's wall-to-wall mapping value of 8,851 ha  
was 148 for 15 month period; updated to annualized figure of 118.4

**Revised uncertainty estimates to account for above updates**

2021 emissions calculations were pulling from wrong activity data cell

Table added to provide consistency and transparency with 2016-2020 reporting approach that used average uncertainty value from 2016-2020 for calculation of total reported ERs

because the units are varied (hectares, cubic meters, and kilometers) the totals are meaningless

Response to CAR re: lacking data on 'settlements'

**Revised uncertainty estimates to account for above updates**

was pulling incorrect cells for EF

**Revised uncertainty estimates to account for above updates**

This workbook provides the calculations and analyses to determine the emissions reductions of Guyan Transactions under TREES 2.0 standards. Below is a brief description of each tab in the workbook. The tabs next, and the output from the Monte Carlo analyses provided at the end. Note that for most of the numbers for reference and for use in developing stochastic numbers and one (always ending in '(MC)') develop the final TREES ERs. To view the stochastic numbers it is necessary to have a SimVoi Excel add

#### Final output

**TREES ERs:** Provides final output for emission reductions from Monte Carlo analyses, calculations for d and final ERs as per ART TREES 2.0. Monte Carlo output (mean and % error) is pulled from Sim Voi Uni

#### Input data, deterministic

**CarbonStocks:** Provides the mean values for all carbon pools, based on field data, along with basic stat

**Deforestation EFs:** Provides deterministic emission factors for each driver of deforestation, using the c reference and developing stochastic numbers.

**Degradation EFs:** Provides deterministic emission factors for each driver of degradation, along with st

**Activity Data:** Provides deterministic activity data (change) for each driver of deforestation and degrad standard error of the activity data based on accuracy assessments. Included for reference and develop

**Emissions:** Provides deterministic estimates of emissions based on deterministic emission factors and

**ART Crediting Period:** Provides deterministic calculations of HFLD crediting level. Included for referenc

**Emission Reductions:** Provides calculations of emission reductions using deterministic inputs. Included

#### Input data, stochastic (note that to function properly these tabs all require the user to have the SimVo

**CarbonStocks (MC):** Provides stochastic numbers for the mean of each pool, based on the determinist

**Deforestation EFs (MC):** Provides stochastic emission factors for each driver of deforestation, using th

**Degradation EFs (MC):** Provides stochastic emission factors for each driver of degradation, using the s

**Activity Data (MC):** Provides stochastic activity data for deforestation, based on data in "Activity Data" insufficient data to reliably generate stochastic estimates).

**Emissions (MC):** Provides stochastic estimates of emissions based on stochastic emission factors and a

**ART Crediting Period (MC):** Provides calculations of HFLD crediting level using stochastic numbers as in

ia's REDD+ program, for submission to the Architecture for REDD+  
tabs are arranged with the final output shown in the first tab, the input data  
ie input data, there are two sets of tabs: one that provides deterministic  
) that provides stochastic numbers used to run the Monte Carlo analysis and  
l-in.

eductions (buffer, leakage, and uncertainty based on Monte Carlo analyses),  
variate Summary for each year.

tistics for each pool.  
deterministic carbon stock values from the CarbonStocks tab. Included for

andard deviation.  
dation, as well as total forest area, percent forested and deforested, and the  
oing stochastic numbers.  
activity data. Included for reference.  
ce.  
d for reference.

ji add-in for excel)

tic mean and standard deviation in the 'CarbonStocks' tab.  
e stochastic carbon stock values from the 'CarbonStocks (MC)' tab.  
tochastic degradation emission factors from the 'Degradation EF' tab.  
" tab, and deterministic activity data for degradation (as there are

activity data.  
nput.

original calculations

Year	(GHG ER)	BUF <sub>t</sub> (5% buffer)	deduction)	UNCERTAINTY	
	t CO <sub>2</sub>			90% CI <sub>t</sub>	UA <sub>t</sub>
2016	9,621,015	481,051	-	41.69%	13.29%
2017	9,300,474	465,024	-	45.60%	14.54%
2018	8,869,076	443,454	-	48.16%	15.35%
2019	5,476,826	273,841	-	63.65%	20.29%
2020	7,665,222	383,261	-	54.49%	17.37%
<b>Total (2016-20)</b>	<b>41,066,844</b>	<b>2,053,342</b>	-	<b>41.49%</b>	<b>13.23%</b>
2021	8,934,274	446,714	-	47.16%	15.03%
2022	10,808,175	540,409	-	44.55%	14.20%

Applying Section 8 of TREES (for 2016-2020); providing for comparison with previous

Year	(GHG ER)	BUF <sub>t</sub> (5% buffer)	deduction)	UNCERTAINTY	
	t CO <sub>2</sub>			90% CI <sub>t</sub>	UA <sub>t</sub>
2016	9,621,015	481,051	-		13.23%
2017	9,300,474	465,024	-		13.23%
2018	8,869,076	443,454	-		13.23%
2019	5,476,826	273,841	-		13.23%
2020	7,665,222	383,261	-		13.23%
<b>Total (2016-20)</b>	<b>40,932,614</b>	<b>2,046,631</b>	-	<b>41.49%</b>	<b>13.23%</b>

UNC <sub>t</sub>	TREES ER
t CO2	
1,278,711	7,861,253
1,352,121	7,483,329
1,361,677	7,063,946
1,111,303	4,091,682
1,331,609	5,950,353
5,432,420	33,581,082
1,343,198	7,144,362
1,534,838	8,732,929

us reporting	
UNC <sub>t</sub>	TREES ER
t CO2	
1,272,860	7,867,104
1,230,453	7,604,998
1,173,379	7,252,244
724,584	4,478,401
1,014,109	6,267,852
5,415,385	33,470,598



	AG Tree (tC/ha)	BG Tree (tC/ha)	Saplings (tC/ha)	Standing Dead Wood (tC/ha)
mean of all plots (calculated)	205.8	48.3	3.7	2.6
std. dev	60.4	14.3	2.0	4.0
minimum	91.6	21.2	0.5	0.0
maximum	353.7	83.1	18.8	13.7
90% CI	9.2	2.2	0.3	0.6
CI as % of mean	4.5%	4.5%	8.5%	23.8%
no. of plots	118	118	118	118
# subplots (4/plot)	472	472	472	472

Lying Dead Wood (tC/ha)	Sum Carbon pools w/o litter (t C/ha)	Litter (tC/ha)	Sum C pool w/ litter (t C/ha)	Sum CO <sub>2</sub> e (t CO <sub>2</sub> e/ha)	Soil tC/ha
8.6	269.0	3.3	272.3	998.5	58.7
8.1	75.2	1.3			61.5
0.0		1.2			10.1
42.3		8.7			502.4
1.2	11.5	0.2			11.0
14.3%	4.3%				18.7%
118	118				87
472	472				

Sum ALL POOLS (t CO <sub>2</sub> e/ha)	Sum aboveground and belowground live tree
1,213.7	931.9

Stratum	Drivers	Emission Factors		
		tC/ha	t CO2/ha	uncertainty (IPCC approach 1)
Combined - all forest	Forestry infrastructure	286.7	1,051.3	4.8%
	Agriculture	302.8	1,110.4	4.8%
	Mining (medium and large scale)	286.7	1,051.3	4.8%
	Mining infrastructure	286.7	1,051.3	4.8%
	Infrastructure	286.7	1,051.3	4.8%
	Settlements	286.7	1,051.3	4.8%
	Fire-Biomass burning		1,053.0	4.8%
	Shifting Cultivation		1,106.0	

### Soil

Stratum	C stock (t C/ha)	FLU	FMG
<b>Combined - all forest</b>	58.71		
Conversion to permanent agriculture		0.48	1.00
Mining		0.82	1.00
Conversion to unpaved roads		0.82	1.00
Shifting cultivation-short cycle		0.65	1.00
Shifting cultivation-long cycle		0.80	1.00

### Fire

Stratum	Total biomass minus BG (t C/ha)	Fire EF CO2 (g/kg dry mass)	Global Warming Potential
Combined - all forest	223.98		
CO2		1,580.00	1
CH4		6.80	28
N2O		0.20	265

uncertainty (IPCC approach 1)
35.37
35.37
35.37
35.37
35.37
35.37
35.37

FI	C stock at 20 yr (t C/ha)	Change in Soil C (t C/ha)	CI for soil (IPCC approach 1)
			18.7%
			10.97
1.00	28.18	30.53	
0.92	44.29	14.42	
0.92	44.29	14.42	
1.00	38.16	20.55	
1.00	46.97	11.74	

Combustion factor (dimension- less)	Fire Emissions (t CO2e/ha)
0.50	353.9
0.50	42.6
0.50	11.9



Logging Emission Factors						
Component	Unit	Factor (tC)	<i>Std Dev</i> (tC)	<i>90% CI</i> (tC)	t CO <sub>2</sub>	<i>Std Dev</i> (tCO <sub>2</sub> )
LDF	per m <sup>3</sup>	1.05	0.68	0.08	3.85	2.49
Wood Density of timber harvested	per m <sup>3</sup>	0.40	0.03	0.00	1.47	0.11
LIF (Skid Trails)	per km	46.87	8.08	1.60	171.84	29.63

Degrading Activity	EF (tCO <sub>2</sub> /AD)	<i>MAD</i> (tCO <sub>2</sub> )
Forestry infrastructure	8.1	8.1
Mining (medium and large scale)	8.1	8.1
Mining infrastructure	8.1	8.1
Infrastructure	8.1	8.1

<i>90% CI (tCO2)</i>
<i>0.29</i>
<i>0.01</i>
<i>5.87</i>



Deforestation	Drivers	units	2011	2012	2013
	Forestry infrastructure		186	240	330
	Agriculture		41	440	424
	Mining (medium and large scale)		7,340	13,664	11,518
	Infrastructure	ha	118	127	342
	Settlements		-	-	23
	Fire-Biomass burning		46	184	96
	<a href="#">Shifting Cultivation</a>				
Deforestation			7,731	14,655	12,733
Degradation	Logging - volume harvested	m3	608,730	585,108	624,287
	Logging - skid trail length	km	2,302	2,212	2,360
	Illegal logging (subset of logging volume, for reference only)	m3	<a href="#">2776</a>	<a href="#">2,306</a>	<a href="#">2,371</a>
	Mining and Infrastructure (buffer area)	ha			

total forest area	18,378,300	18,487,880	18,475,140
percent deforested	0.042%	0.079%	0.069%
% forested	85.48	85.99	85.93

		Standard Er			
Drivers	units	2011	2012	2013	
Forestry infrastructure		<a href="#">28</a>	<a href="#">36</a>	<a href="#">44</a>	
Agriculture		<a href="#">6</a>	<a href="#">65</a>	<a href="#">56</a>	
Mining (medium and large scale)		<a href="#">1,089</a>	<a href="#">2,028</a>	<a href="#">1,530</a>	
Infrastructure	ha	<a href="#">18</a>	<a href="#">19</a>	<a href="#">45</a>	
Settlements		-	-	3	
Fire-Biomass burning		<a href="#">7</a>	<a href="#">27</a>	<a href="#">13</a>	
<a href="#">Shifting Cultivation</a>		-	-	-	
total deforestation (% SE)		<a href="#">15%</a>	<a href="#">15%</a>	13%	

Drivers	units	2011	2012	2013	
Forestry infrastructure					
Agriculture					
Mining (medium and large scale)					
Mining infrastructure	ha				
Infrastructure					

Settlements		
Fire-Biomass burning		
Shifting Cultivation		
total deforestation		13,695

					\$
Drivers	units	2011	2012	2013	
Forestry infrastructure					
Agriculture					
Mining (medium and large scale)					
Mining infrastructure					
Infrastructure	ha				
Settlements					
Fire-Biomass burning					
Shifting Cultivation					
total deforestation					1,819

Change Data from Wall-to-Wall mapping by GFC						
2014	2015	2016	2017	2018	2019	2020
<b>Deforestation</b>						
204	313	313	227	356	226	195
817	379	379	477	512	246	489
10,434	6,782	6,782	7,442	7,624	5,821	6,452
141	217	217	195	67	52	102
71	8	8	7	7	22	60
259	1,509	1,509	502	661	6,371	2,933
			494	436	431	554
11,926	9,208	9,208	8,850	9,227	13,169	10,786
<b>Degradation</b>						
759,684	655,406	500,788	533,106	546,242	521,172	545,355
2,872	2,478	1,893	2,016	2,065	1,971	2,062
2,836	1,505	2,249	2,706	3,719	2,149	1,281
		36,647	31,919	28,185	23,028	22,795

18,470,570	18,452,160	18,452,160	18,442,960	18,070,080	18,057,340	18,001,790
0.065%	0.050%	0.050%	0.048%	0.051%	0.073%	0.060%
85.91	85.82	85.82	85.78	84.05	83.99	83.73
total land	21,500,000				total land	21,500,000
% forested	85.8%				% forested	83.7%

ror (estimated based on ratios from MRVS report accuracy assessment)						
2014	2015	2016	2017	2018	2019	2020
25	37	37	36	65	39	29
101	45	45	76	94	42	348
1,286	810	810	1,180	1,393	1,003	1,094
17	26	26	31	12	9	73
9	1	1	1	1	4	9
32	180	180	80	121	1,098	1,204
-	-	-	78	80	74	83
12%	12%	12%	16%	18%	17%	15%

Deforestation (from accuracy assessments in MRVS reports)						
2014	2015	2016	2017	2018	2019	2020
						419
						8,480
						465

1,303

12,219                      16,239                      8,851                      6,983                      8,202                      10,667

Standard Error (from accuracy assessments in MRVS reports)

2014                      2015                      2016                      2017                      2018                      2019                      2020

298

1,438

329

535

1,506                      1,940                      1,403                      1,276                      1,413                      1,597

-                      2,600

1,003

2021	2022	2023
228	155.6	
216	281.6	
6,825	5,264.3	
117	110.6	
105	169.4	
139	332.9	
393	155.5	
8,023	6,470	
547,516	622,643	
2,070	2,354	
1,281	2,548	
26,651	18,417	

17,986,231	17,821,555
0.045%	0.036%
83.66	82.89
21,500,000	21,500,001
83.7%	82.9%

2021	2022	2023
50	29	
153	141	
1,042	1,097	834
26	21	
23	32	520
31	63	
393	29	269
22%	19%	

2021	2022	2023
367	655	190
7,199	3,806	5,835
	164	

328		1,473
202		752
8,096	4,625	8,250

2021	2022	2023
260	327	190
1,099	793	834
	164	
231		520
202		269
1,792	874	1,229
1,792	1,284	1,813
-	410	584

Drivers	units	2011	2012	2013
Forestry infrastructure		195,547	252,319	346,938
Agriculture		45,526	488,574	470,808
Mining (medium and large scale)	tCO2	7,716,752	14,365,354	12,109,203
Infrastructure		124,477	133,519	359,554
Settlements		-	-	24,181
Fire-Biomass burning		48,437	193,748	101,086
Shifting Cultivation				
<b>Deforestation</b>		<b>8,130,740</b>	<b>15,433,514</b>	<b>13,411,770</b>
Logging (includes both legal and illegal)		3,631,919	3,490,982	3,724,737
Illegal logging (included only for reference)	tCO2	14,759	12,262	12,605
Mining and Infrastructure				
<b>Degradation</b>		<b>3,631,919</b>	<b>3,490,982</b>	<b>3,724,737</b>
<b>TOTAL</b>		<b>11,762,658</b>	<b>18,924,495</b>	<b>17,136,506</b>

#### separated mining emissions

mining AD	ha
mining emissions	tCO2/ha
mining infrastructure AD	ha
mining infrastructure emissions	tCO2/ha
total mining emissions	tCO2

2014	2015	2016	2017	2018
214,471	329,066	329,066	238,652	374,273
907,194	420,840	420,840	529,659	568,523
10,969,563	7,130,111	7,130,111	7,823,987	8,015,329
148,237	228,138	228,138	205,009	70,439
74,644	8,411	8,411	7,359	7,359
272,721	1,588,942	1,588,942	528,594	696,018
		-	546,200	482,266
12,586,830	9,705,508	9,705,508	9,879,461	10,214,207
4,532,569	3,910,404	2,987,896	3,180,717	3,259,093
15,077	8,002	11,958	14,389	19,771
	-	295,623	257,481	227,362
4,532,569	3,910,404	3,283,518	3,438,197	3,486,455
17,119,399	13,615,912	12,989,026	13,317,658	13,700,662

7,316	7,362
7,691,327	7,740,261
1,027	734
1,079,374	771,514
8,770,701	8,511,775

	2016	2017	2018
total	12,989,026	13,317,658	13,700,662
deforestation	9,705,508	9,879,461	10,214,207
degradation	3,283,518	3,438,197	3,486,455

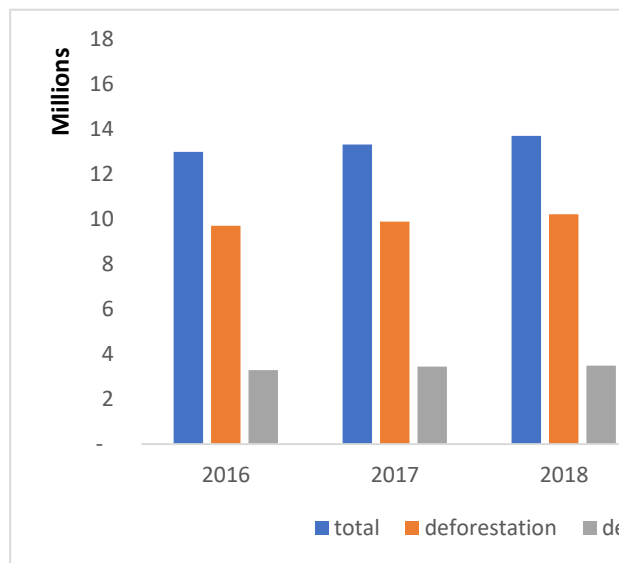


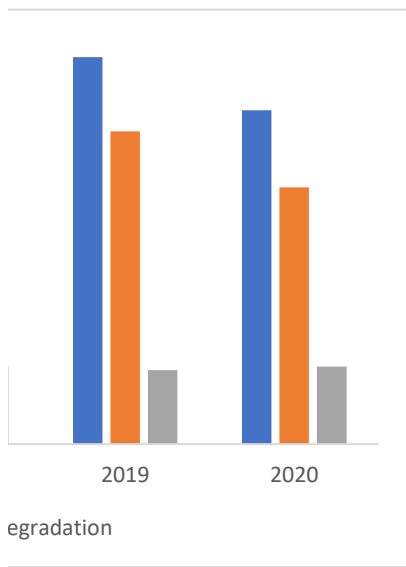
	2019	2020	2021	2022
	237,600	205,521	239,703	163,551
	273,158	542,943	239,846	312,712
	6,119,784	6,783,276	7,175,318	5,534,470
	54,669	107,744	123,005	116,233
	23,129	62,971	110,390	178,107
	6,708,516	3,088,387	146,364	350,543
	476,920	613,138	434,639	171,976
	13,893,776	11,403,980	8,469,264	6,827,592
	3,109,512	3,253,797	3,266,693	3,714,932
	11,425	6,809	6,811	13,546
	185,756	183,877	214,982	148,565
	3,295,268	3,437,674	3,481,675	3,863,498
	17,189,044	14,841,654	11,950,939	10,691,089

5,760	5,895	
6,056,148	6,197,878	-
708	557	
744,188	585,398	-
6,800,336	6,783,276	-

2019	2020
17,189,044	14,841,654
13,893,776	11,403,980
3,295,268	3,437,674

average  
14,407,609  
% of 2020 C stocks  
0.08%





Period 1			Period 2	
Year	Reference Data, tCO2	HFLD Score	Year	Reference Data, tCO2
2011	11,762,658	0.813	2016	12,989,026
2012	18,924,495	0.781	2017	13,317,658
2013	17,136,506	0.790	2018	13,700,662
2014	17,119,399	0.795	2019	17,189,044
2015	13,615,912	0.808	2020	14,841,654

Calculations from TREES 2.0 section 5.2 (August 2021 revised HFLD approach)

<i>CL<sub>1</sub></i>	15,711,794	14,407,609
<i>HFLD Score</i>	0.797	0.790
<i>Carbon Stock</i>	17,196,304,923	16,776,587,131
<b><i>HFLDCL<sub>n</sub></i></b>	<b>22,567,317</b>	<b>21,037,534</b>

0.05% of carbon stocks

8,598,152	8,388,294
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Adjusted to use 0.1% OF ALL C STOCKS, incl. soil

<i>CL<sub>1</sub></i>	14,407,609
<i>HFLD Score</i>	0.790
<i>Carbon Stock</i>	21,849,168,186
<b><i>HFLDCL<sub>n</sub></i></b>	<b>31,676,717</b>

Combined RL calcs

avg emissions	
2016-2020	14,407,609
% C stocks	0.0802%
Hansen 30% cover	0.60%
combined	0.34%
RL (t CO2)	61,126,024

HFLD Score
0.808
0.810
0.789
0.767
0.777

Year	Crediting Level	Actual Emissions	Emission Reductions (GHG ER)	BUF <sub>t</sub> (5% buffer)	LEAK <sub>t</sub> (0 deduction)
	t CO2				
2016	22,567,317	12,989,026	9,578,291	478,915	-
2017	22,567,317	13,317,658	9,249,659	462,483	-
2018	22,567,317	13,700,662	8,866,655	443,333	-
2019	22,567,317	17,189,044	5,378,274	268,914	-
2020	22,567,317	14,841,654	7,725,664	386,283	-
2021	21,037,534	11,950,939	9,086,595	454,330	-
2022	21,037,534	10,691,089	10,346,445	517,322	-

UNC <sub>t</sub>	TREES ER
	9,099,377
	8,787,176
	8,423,322
	5,109,360
	7,339,381
	8,632,265
	9,829,122

	AG Tree (tC/ha)	BG Tree (tC/ha)	Saplings (tC/ha)	Standing Dead Wood (tC/ha)	Lying Dead Wood (tC/ha)
tC/ha	181.1	65.0	3.5	7.3	17.1
tCO2/ha	664.2	238.2	12.8	26.9	62.6

Note that this sheet only functions properly with the SimVoi add-in.

Sum Carbon pools w/o litter (t C/ha)	Litter (tC/ha)	Sum all biomass C pools
-----------------------------------------	----------------	----------------------------

3.7

277.7

13.7

1,018.4

Soil
------

60.6

222.3

Sum ALL POOLS (t CO <sub>2</sub> e/ha)
-------------------------------------------

4,549.2



Sum aboveground  
and belowground  
live tree

902.4

Stratum	Drivers	Emission Factors	
		tC/ha	t CO2/ha
Combined - all forest	Forestry infrastructure	292.6	1,073.0
	Agriculture	309.3	1,134.0
	Mining (medium and large scale)	292.6	1,073.0
	Mining infrastructure	292.6	1,073.0
	Infrastructure	292.6	1,073.0
	Settlements	292.6	1,073.0
	Fire-Biomass burning		1,061.9
	Shifting Cultivation		1,117.4

### Soil

Stratum	C stock (t C/ha)	FLU	FMG
<b>Combined - all forest</b>	60.64		
Conversion to permanent agriculture		0.48	1.00
Mining		0.82	1.00
Conversion to unpaved roads		0.82	1.00
Shifting cultivation-short cycle		0.65	1.00
Shifting cultivation-long cycle		0.80	1.00

### Fire

Stratum	Total biomass minus BG (t C/ha)	Fire EF CO2 (g/kg dry mass)	Global Warming Potential
Combined - all forest	212.78		
CO2		1,580.00	1
CH4		6.80	21
N2O		0.20	310

Note that this sheet only functions properly with the SimVoi add-in.

FI	C stock at 20 yr (t C/ha)	Change in Soil C (t C/ha)
1.00	29.11	31.53
0.92	45.74	14.89
0.92	45.74	14.89
1.00	39.41	21.22
1.00	48.51	12.13

Combustion factor (dimension-less)	Fire Emissions (t CO <sub>2</sub> e/ha)
0.50	336.2
0.50	30.4
0.50	13.2



Logging Emission Factors		
Component	Unit	t CO2
LDF	per m <sup>3</sup>	4.54
Wood Density of timber harvested	per m <sup>3</sup>	1.39
LIF (Skid Trails)	per km	185.88

Degrading Activity	EF (tCO2/ha)
Forestry infrastructure	7.2
Mining (medium and large scale)	7.2
Mining infrastructure	7.2
Infrastructure	7.2

Note that this sheet

t only functions properly with the SimVoi add-in.

Deforestation	Drivers	units	2011	2012	2013
	Forestry infrastructure		225	194	270
	Agriculture		36	384	463
	Mining (medium and large scale)		8,835	13,157	7,687
	Infrastructure	ha	117	121	331
	Settlements		-	-	25
	Fire-Biomass burning		53	188	89
	Shifting Cultivation				
Degradation	<b>Deforestation</b>		9,266	14,044	8,863
	Logging - volume harvested	m3	608,730	585,108	624,287
	Logging - skid trail length	km	2,302	2,212	2,360
	Illegal logging	m3	2776	2,306	2,371
	Mining and Infrastructure (buffer area)	ha			

total forest area	18,378,300	18,487,880	18,475,140
percent deforested	0.050%	0.076%	0.048%
% forested	85.48	85.99	85.93

Note that this sheet only functions properly with the SimVoi add-in.

Change						
2014	2015	2016	2017	2018	2019	2020
229	325	288	224	244	228	185
882	436	401	487	291	261	126
12,583	7,673	7,082	6,619	6,295	5,518	6,980
143	182	236	196	72	33	188
73	7	7	7	9	29	53
301	1,833	1,553	460	681	6,194	3,364
			451	361	509	478
14,210	10,457	9,568	7,993	7,592	12,772	11,373
759,684	655,406	500,788	533,106	546,242	521,172	545,355
2,872	2,478	1,893	2,016	2,065	1,971	2,062
2,836	1,505	2,249	2,706	3,719	2,149	1,281
		36,647	31,919	28,185	23,028	22,795

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18,470,570	18,452,160	18,452,160	18,442,960	18,070,080	18,057,340	18,001,790
0.077%	0.057%	0.052%	0.043%	0.042%	0.071%	0.063%
85.91	85.82	85.82	85.78	84.05	83.99	83.73
total land	21,500,000				total land	21,500,000
% forested	85.8%				% forested	83.7%



2021	2022
215	83
436	305
7,303	6,163
101	117
110	210
221	365
456	109
8,842	7,353
547,516	547,517
2,070	2,070
1,281	1,281
26,651	26,651

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#DIV/0!
0.00
21,500,001
0.0%

Drivers	units	2011	2012	2013
Forestry infrastructure		241,594	208,611	289,633
Agriculture		41,036	435,511	524,714
Mining (medium and large scale)	tCO2	9,479,796	14,117,045	8,247,622
Infrastructure		125,288	129,973	354,899
Settlements		-	-	26,317
Fire-Biomass burning		55,974	199,540	94,090
Shifting Cultivation				
<b>Deforestation</b>		9,943,689	15,090,681	9,537,275
Logging		4,038,126	3,881,426	4,141,325
Illegal logging	tCO2	16,464	13,679	14,061
Mining and Infrastructure				
<b>Degradation</b>		4,038,126	3,881,426	4,141,325
<b>TOTAL</b>		13,981,814	18,972,107	13,678,600

Note that this sheet only functions properly with the SimVoi add-in.

2014	2015	2016	2017	2018
246,058	348,853	308,654	240,095	261,485
999,727	494,631	454,779	552,231	329,974
13,501,339	8,233,168	7,599,187	7,102,450	6,754,722
152,950	195,364	253,645	210,808	77,233
78,166	8,034	7,631	6,999	9,689
319,449	1,946,314	1,649,411	488,624	722,876
		-	504,442	403,592
15,297,689	11,226,365	10,273,308	9,105,650	8,559,570
5,039,508	4,347,758	3,322,073	3,536,460	3,623,602
16,819	8,927	13,339	16,051	22,055
	-	264,179	230,094	203,179
5,039,508	4,347,758	3,586,252	3,766,553	3,826,780
20,337,197	15,574,123	13,859,559	12,872,203	12,386,351

	2019	2020	2021	2022
	244,726	198,233	230,334	89,049
	296,250	142,943	494,037	346,261
	5,920,926	7,489,151	7,836,082	6,613,094
	34,882	201,456	108,768	125,419
	31,312	57,317	118,436	225,814
	6,577,214	3,572,417	234,514	388,036
	568,650	533,776	509,673	121,240
	13,673,960	12,195,294	9,531,843	7,908,913
	3,457,291	3,617,714	3,632,052	3,632,059
	12,745	7,596	7,597	7,597
	165,998	164,318	192,116	192,116
	3,623,289	3,782,032	3,824,167	3,824,174
	17,297,249	15,977,326	13,356,011	11,733,087

Period 1			Period 2	
Year	Reference Data, tCO2	HFLD Score	Year	Reference Data, tCO2
2011	13,981,814	0.804	2016	13,859,559
2012	18,972,107	0.784	2017	12,872,203
2013	13,678,600	0.811	2018	12,386,351
2014	20,337,197	0.782	2019	17,297,249
2015	15,574,123	0.802	2020	15,977,326

Calculations from TREES 2.0 section 5.2 (August 2021 revised HFLD approach)

<i>CL<sub>1</sub></i>	16,508,768	14,478,538
<i>HFLD Score</i>	0.797	0.793
<i>Carbon Stock</i>	16,650,806,229	16,244,402,664
<b><i>HFLDCL<sub>n</sub></i></b>	<b>23,141,434</b>	<b>20,915,507</b>

Adjusted to use 0.1% of  
ALL C stocks, incl. soil

<i>CL<sub>1</sub></i>	14,478,538
<i>HFLD Score</i>	0.793
<i>Carbon Stock</i>	-
<b><i>HFLDCL<sub>n</sub></i></b>	<b>14,478,538</b>

<b>HFLD Score</b>
0.806
0.814
0.798
0.769
0.774

Note that this sheet only functions properly with the SimVoi add-in.

Year	Crediting Level	Actual Emissions	Emission Reductions (GHG ER)
	t CO2		
2016	23,141,434	13,859,559	9,281,874
2017	23,141,434	12,872,203	10,269,230
2018	23,141,434	12,386,351	10,755,083
2019	23,141,434	17,297,249	5,844,185
2020	23,141,434	15,977,326	7,164,108
<b>Total 2016-2020</b>	<b>115,707,168</b>	<b>72,392,688</b>	<b>43,314,480</b>
2021	20,915,507	13,356,011	7,559,497
2022	20,915,507	11,733,087	9,182,421

Note that this sheet only functions properly with the SimVoi add-in.

### SimVoi 3.04 Univariate Summary

	Emission Reductions (GHG ER)
Mean	<b>9,621,015</b>
St. Dev.	2,426,734
Mean St. Error	24,267
Skewness	+0.239
Minimum	2,115,494
First Quartile	7,945,977
Median	9,510,716
Third Quartile	11,207,730
Maximum	19,907,597



### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)!	\$D\$4
Mean		<b>9,300,474</b>
St. Dev.		2,590,151
Mean St. Error		25,902
Skewness		+0.319
Minimum		1,335,816
First Quartile		7,464,890
Median		9,176,563
Third Quartile		10,977,564
Maximum		20,271,859

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)!	\$D\$5
Mean		<b>8,869,076</b>
St. Dev.		2,617,777
Mean St. Error		26,178
Skewness		+0.401
Minimum		1,403,679
First Quartile		7,023,030
Median		8,716,691
Third Quartile		10,493,525
Maximum		22,678,304

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)!	\$D\$6
Mean		<b>5,476,826</b>
St. Dev.		2,154,425
Mean St. Error		21,544
Skewness		+0.438
Minimum		(1,496,128)
First Quartile		3,951,392
Median		5,305,037
Third Quartile		6,824,968
Maximum		15,249,365

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)'!\$D\$7
Mean	7,665,222
St. Dev.	2,568,419
Mean St. Error	25,684
Skewness	+0.406
Minimum	(570,309)
First Quartile	5,829,621
Median	7,471,766
Third Quartile	9,270,654
Maximum	19,765,265

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)'!\$D\$8
Mean	<b>41,066,844</b>
St. Dev.	10,358,139
Mean St. Error	103,581
Skewness	+0.222
Minimum	8,926,308
First Quartile	33,939,059
Median	40,664,402
Third Quartile	47,753,501
Maximum	88,925,345

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)!	\$D\$9
Mean		<b>8,934,274</b>
St. Dev.		2,563,729
Mean St. Error		25,637
Skewness		+0.290
Minimum		1,415,574
First Quartile		7,087,103
Median		8,817,453
Third Quartile		10,598,119
Maximum		19,479,082

### SimVoi 3.04 Univariate Summary

	Emission Reductions (MC)'!\$D\$10
Mean	<b>10,808,175</b>
St. Dev.	2,932,039
Mean St. Error	29,320
Skewness	+0.234
Minimum	1,445,224
First Quartile	8,749,597
Median	10,702,141
Third Quartile	12,725,837
Maximum	24,468,691