WORLD RESOURCES INSTITUTE

GLOBAL FOREST WATCH

Initiative 20x20

Global Forest Watch y Collect Earth como puntos de partida para la estimación de carbono de la restauración: De lo Nacional a lo local y relevancia para los NDC

Dr. René Zamora Cristales

28 de Agosto del 2020

Los bosques como pilar de desarrollo

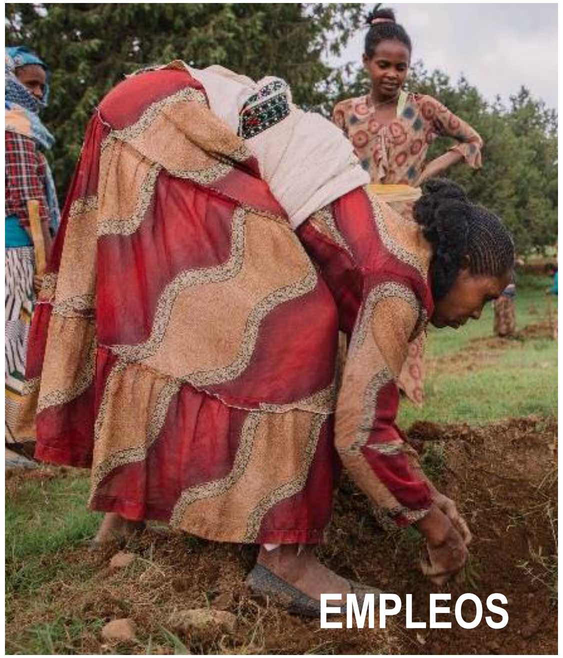
Salvaguardar
- De la fragmentación
- De la degradación
- De la deforestación

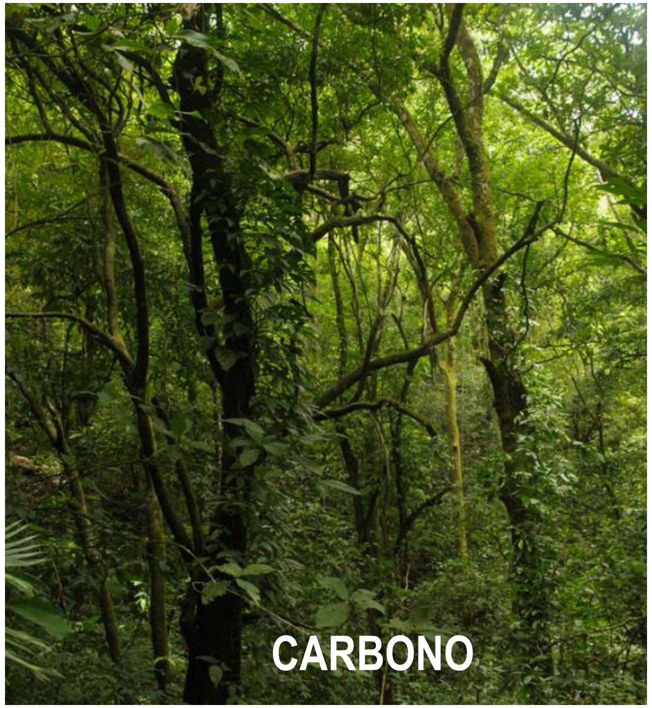
Mantener
- Calidad de los bosques sus bienes y servicios

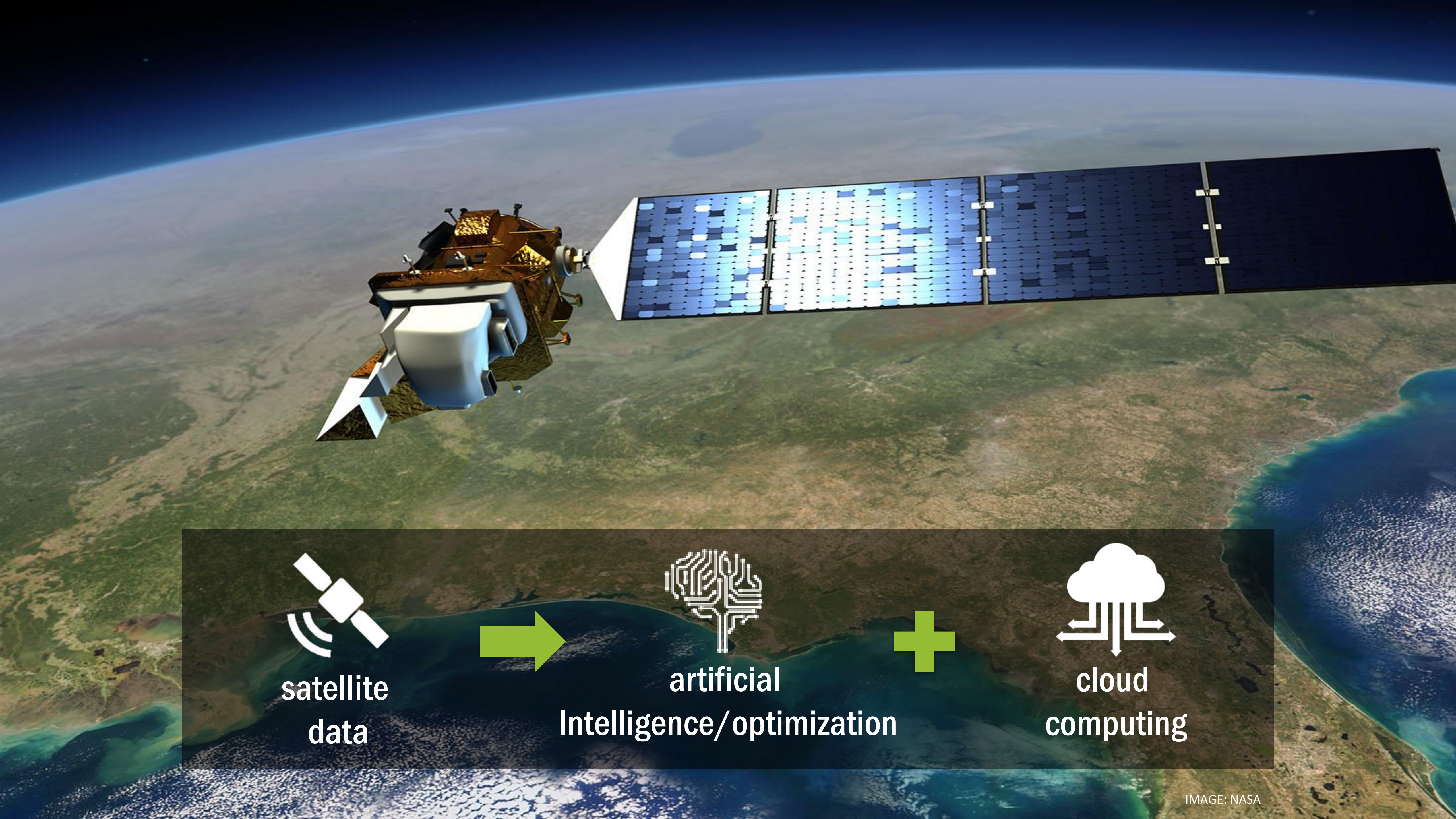
Restaurar
- Conectividad
- Bosques saludables
- Paisajes agrícolas sostenibles: Agroforestería/silvo pasturas

Adaptado de la versión de Taylor (2017)

El rol de la restauración?

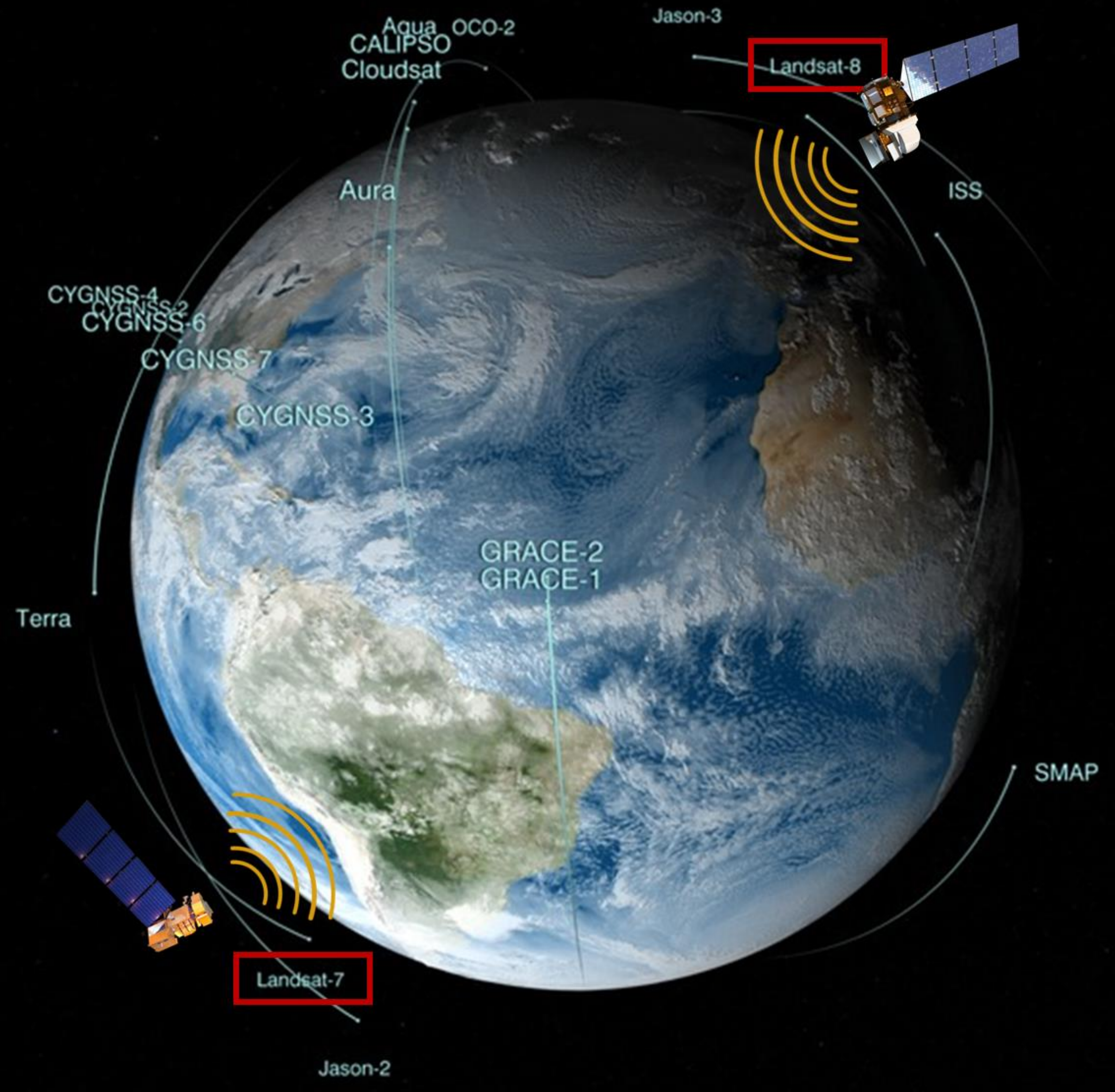





satellite
data
artificial
Intelligence/optimization
cloud
computing
IMAGE: NASA

Why Satellites + Remote Sensing?

- Monitor large areas cheaply – Landsat images are free
- Repeat coverage – repeat images every 8 days
- Ability to monitor areas without visiting them in person



Source: NASA

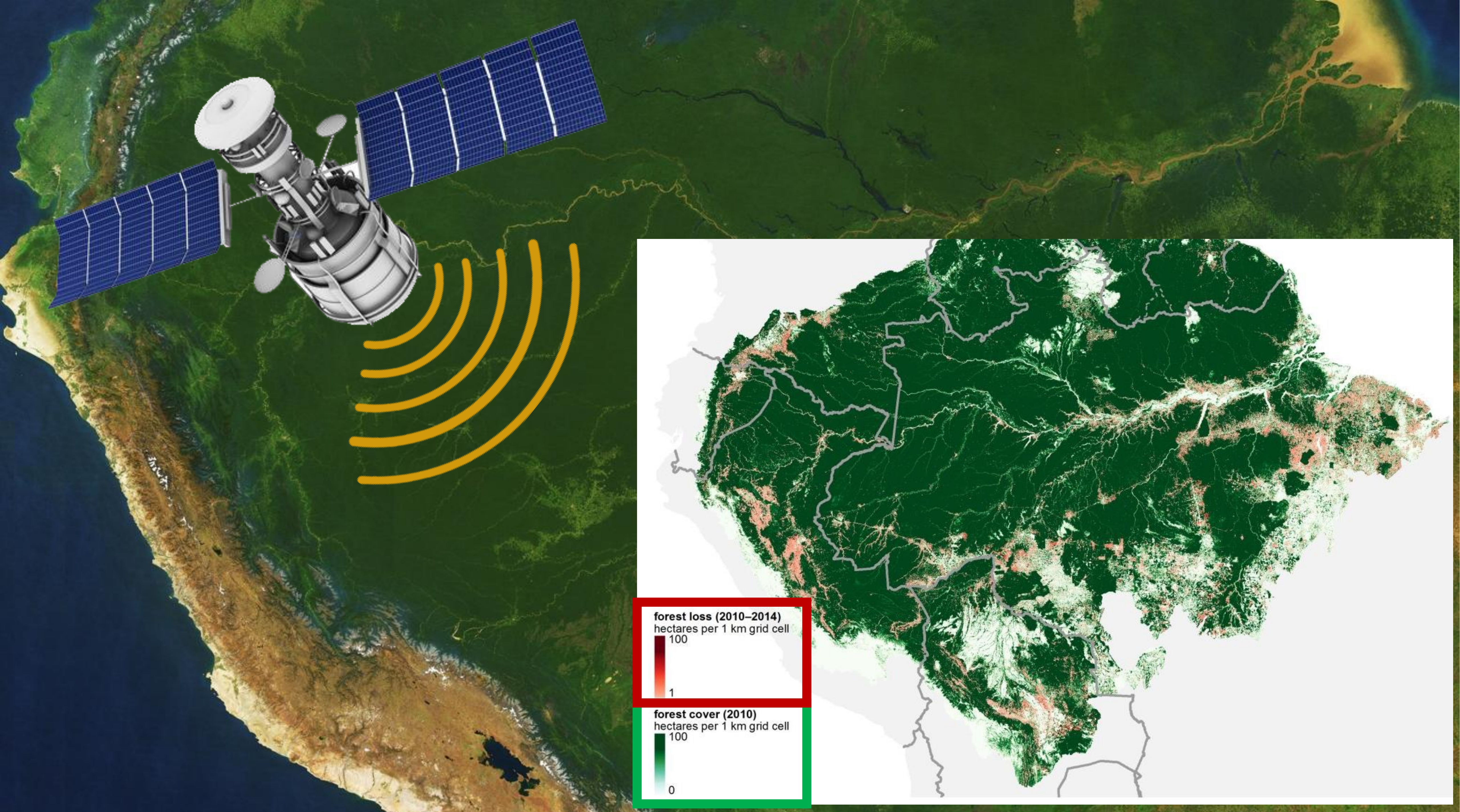
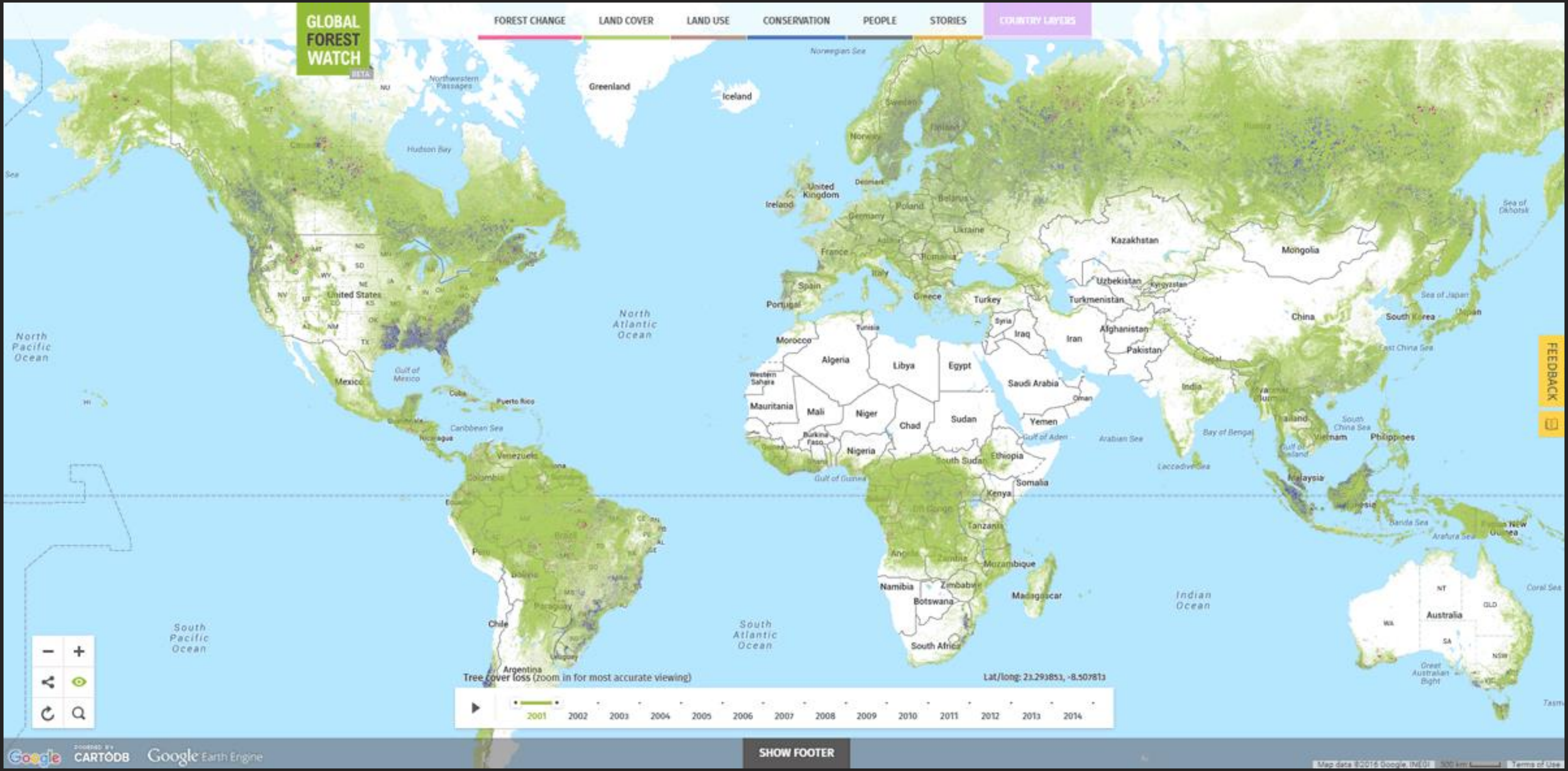
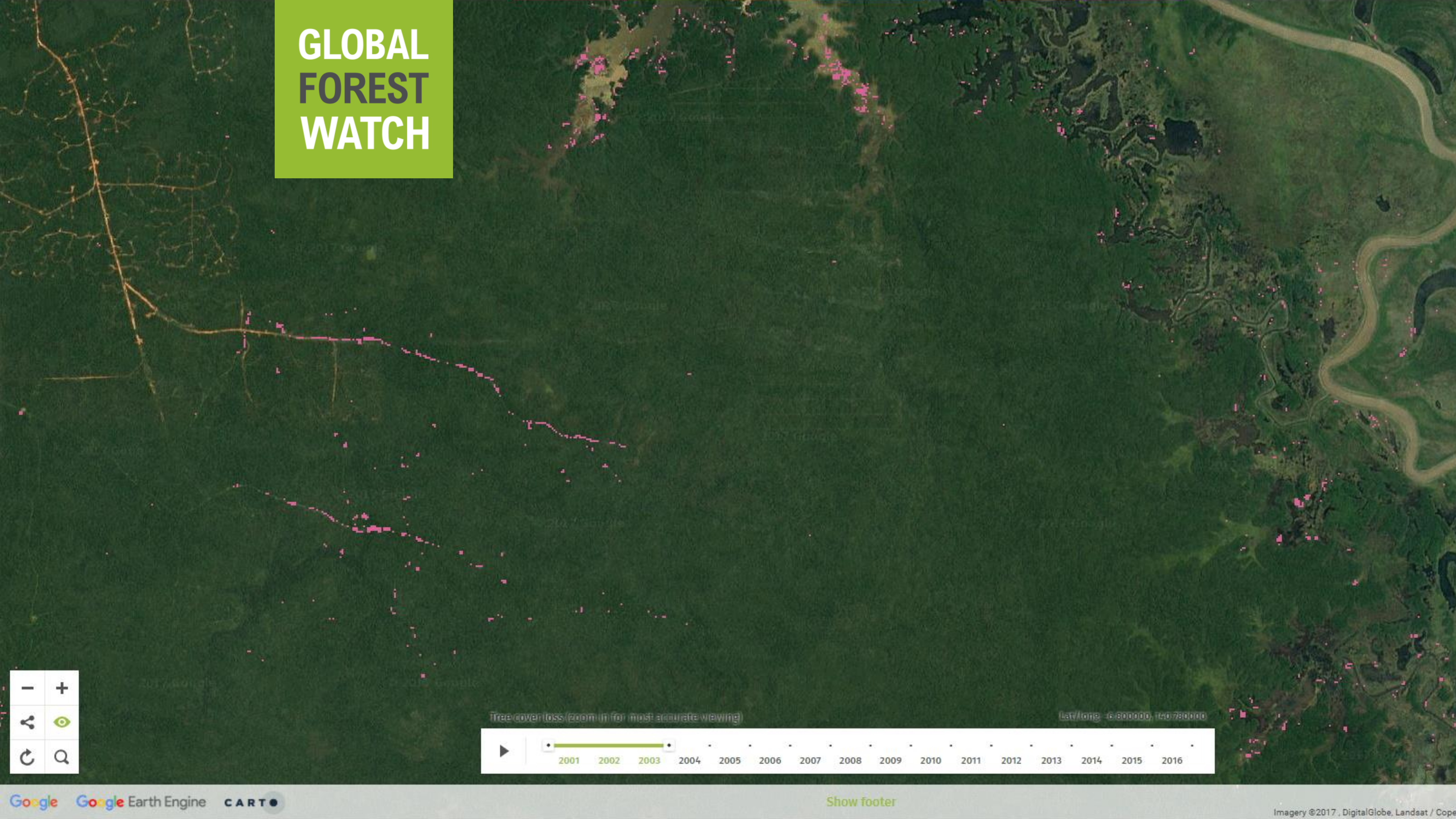


Photo: Mapbox

GLOBAL FOREST COVER AND CHANGE




GLOBAL
FOREST
WATCH

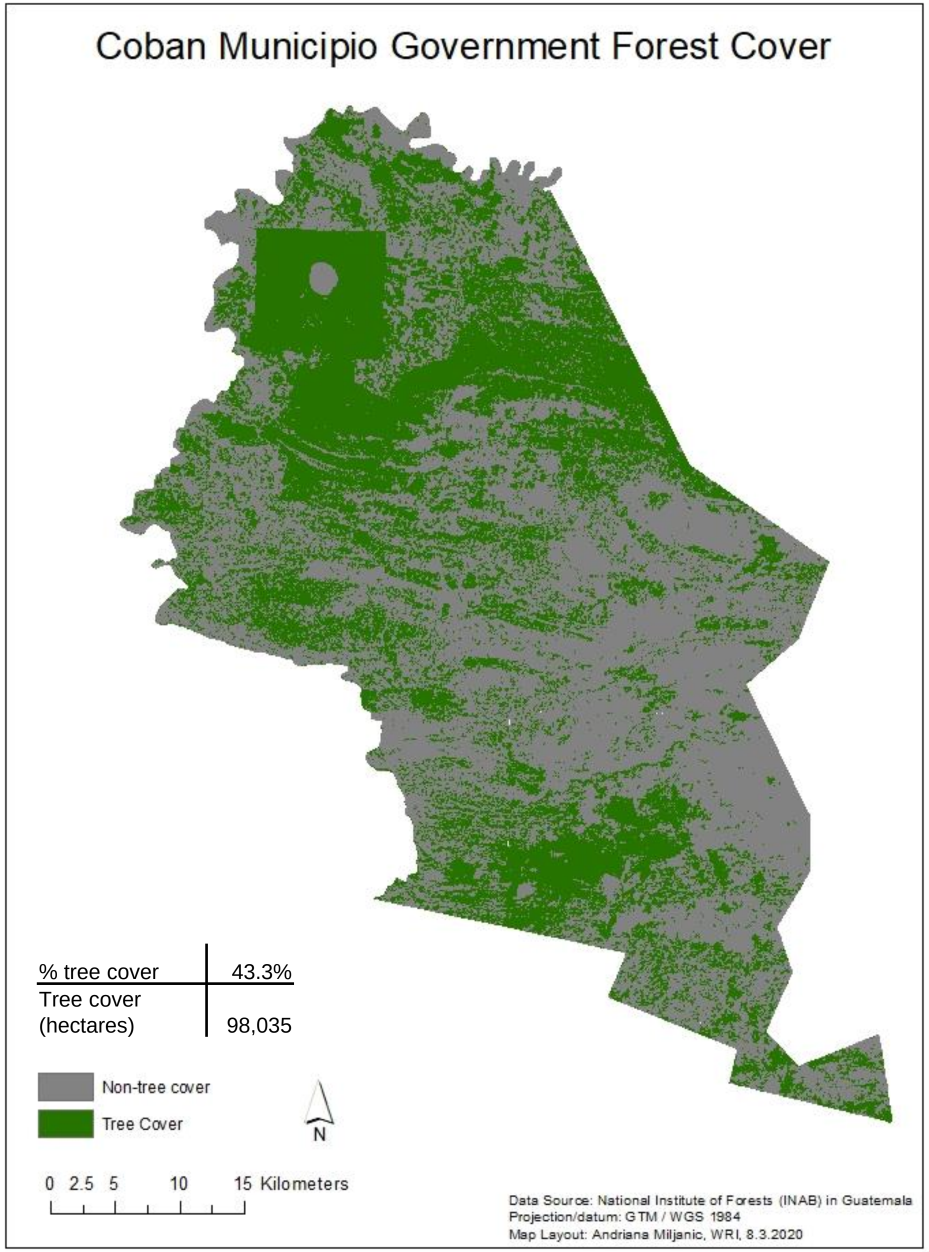

GLOBAL FOREST WATCH
Tree cover loss (zoom in for most accurate viewing)
Lat/long: -6.800000, 140.780000
2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016
Google Earth Engine
CARTO
Show footer
Imagery ©2017 , DigitalGlobe, Landsat / Cope

Initiative 20x20

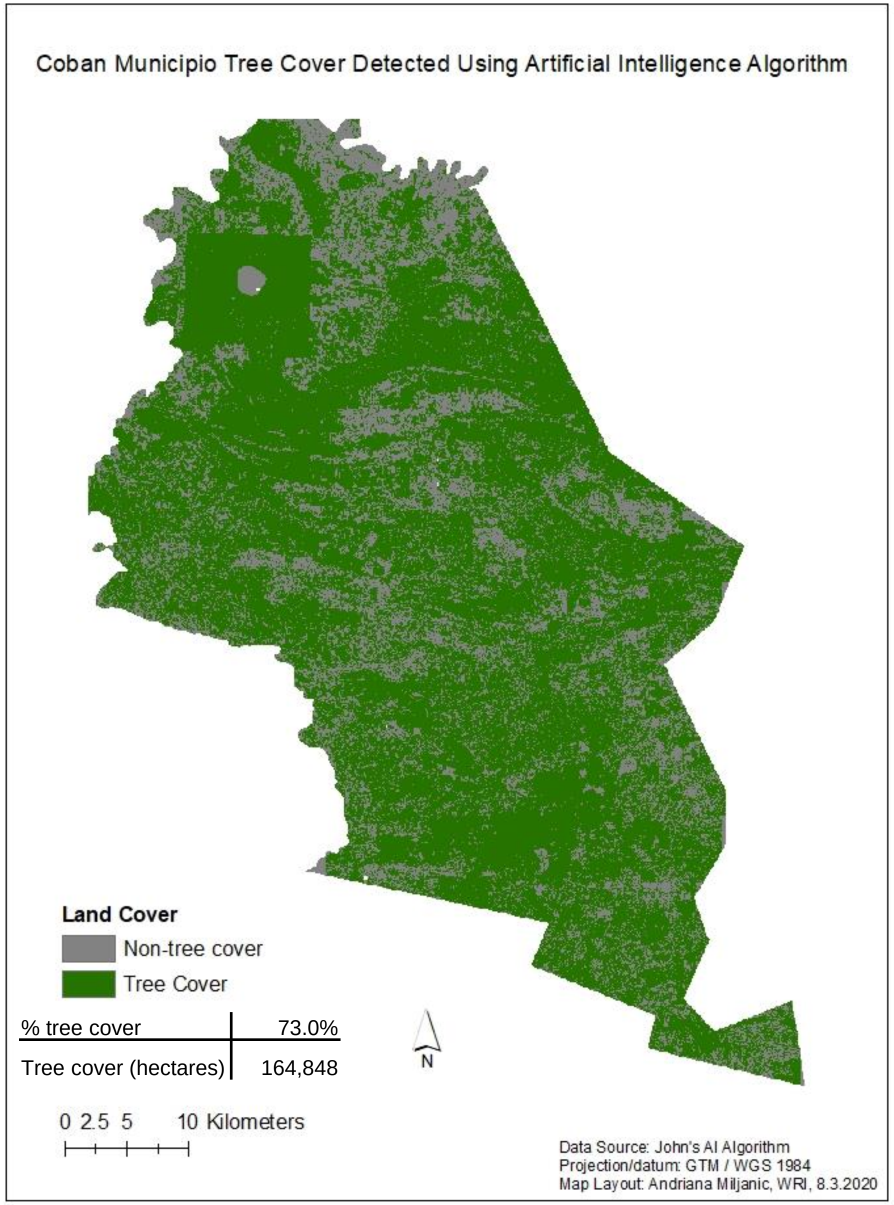
Restaurar el Paisaje

Cobán, Alta Verapaz

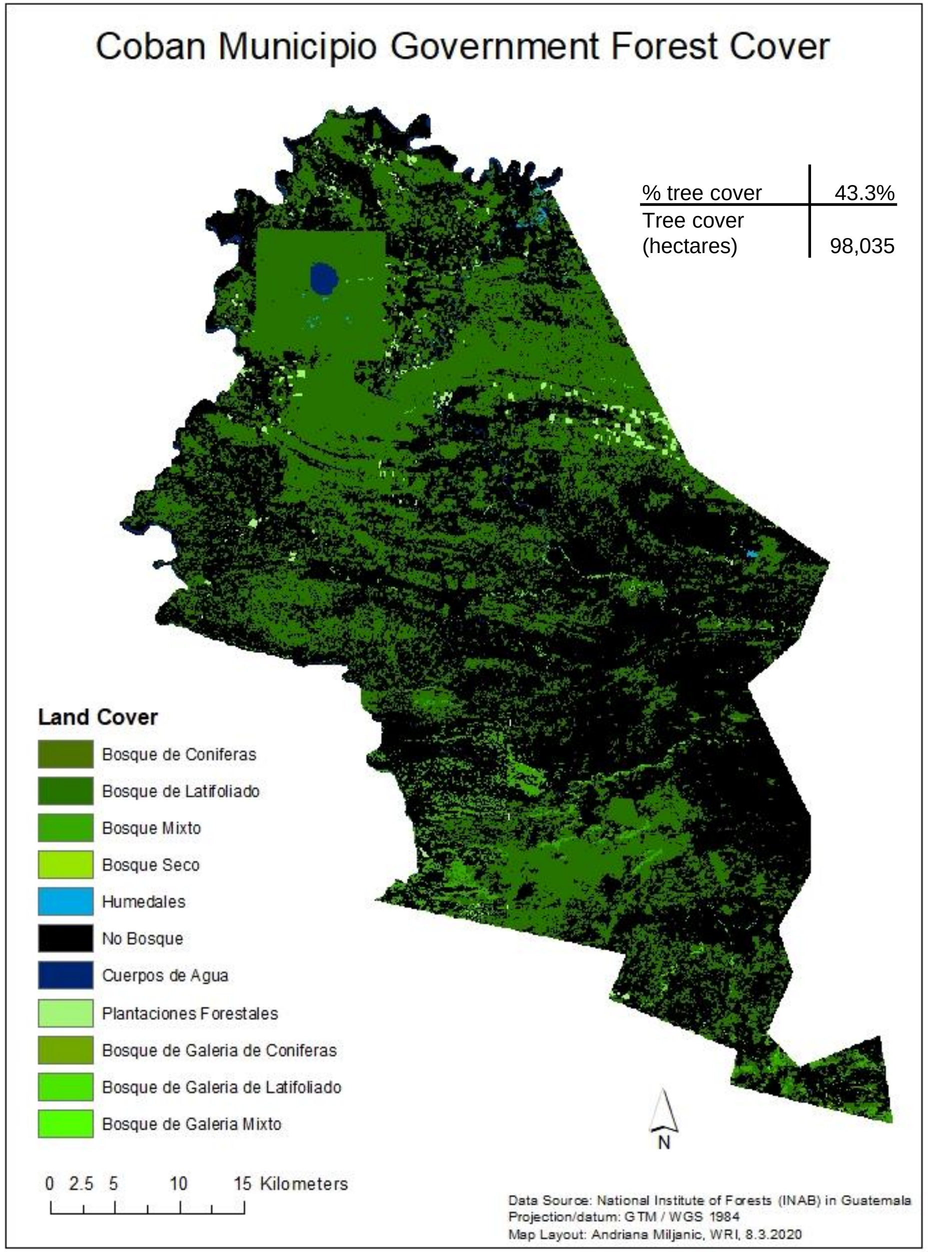
Government Information 2016



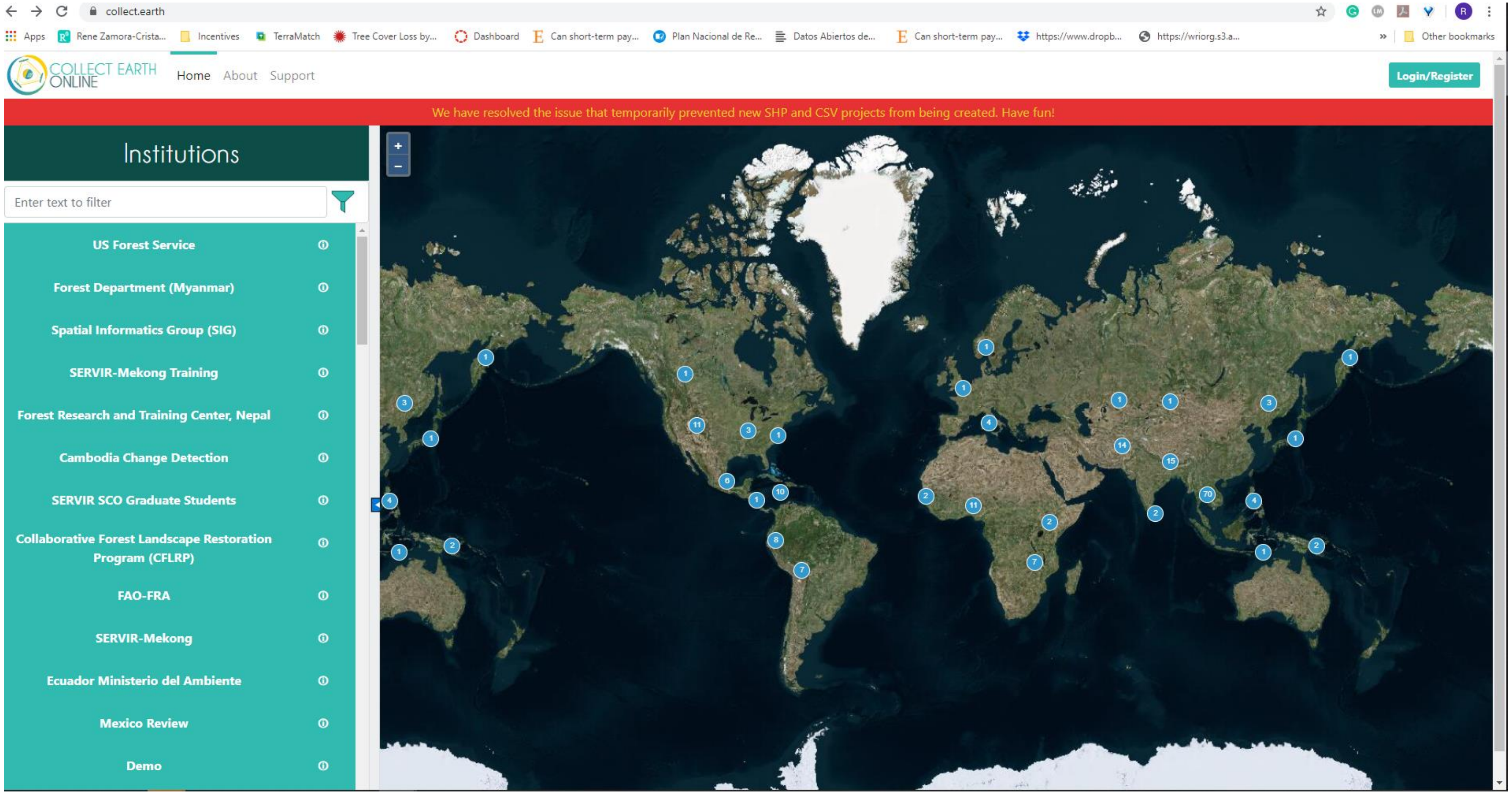
Métodos de Inteligencia artificial



Government Information 2016

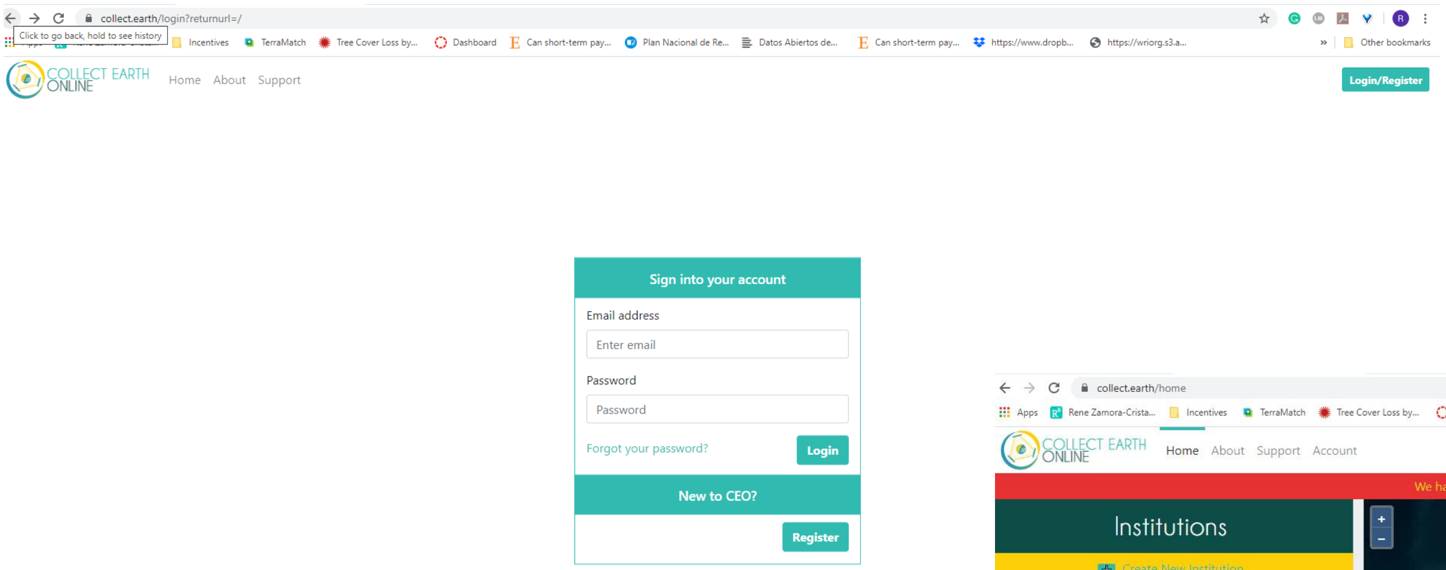


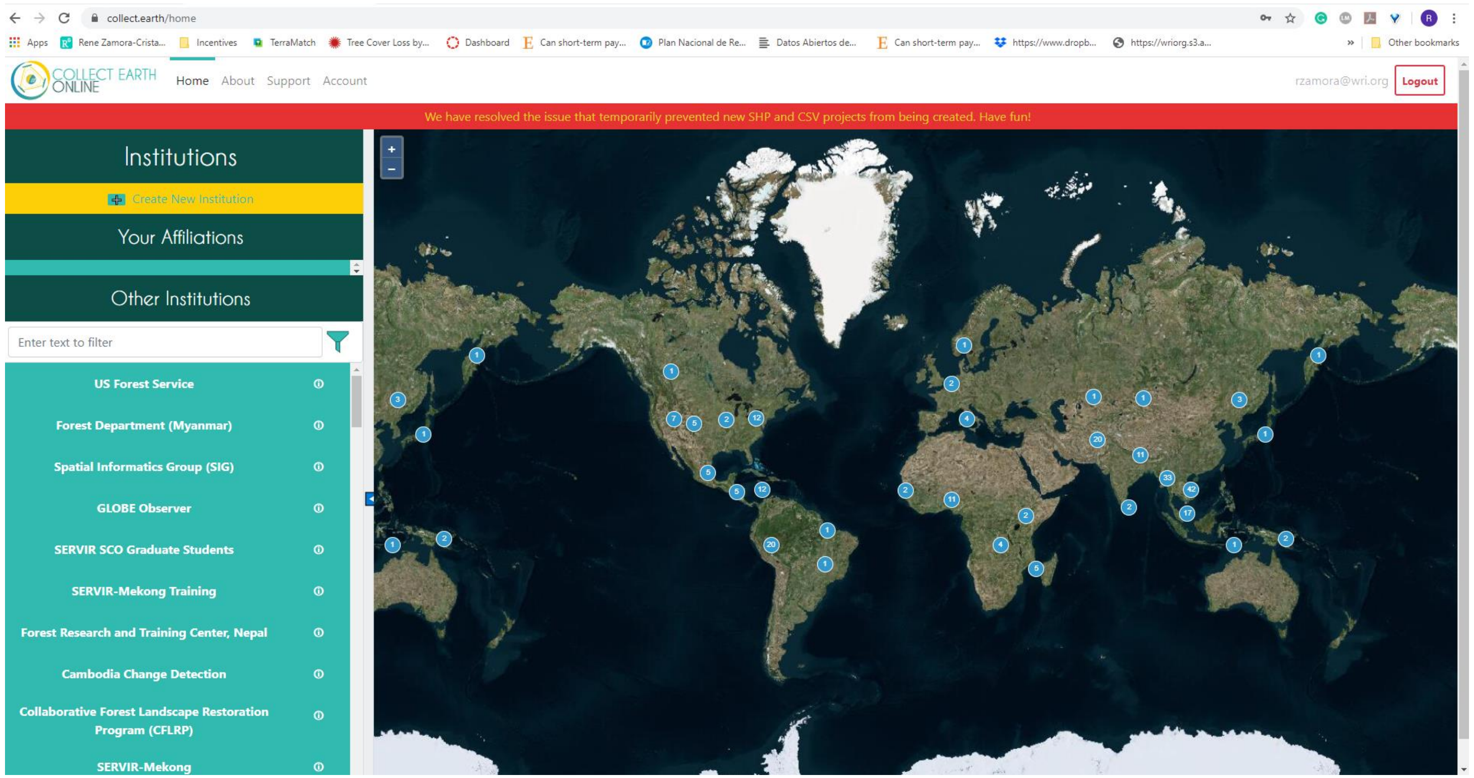
Collect Earth Tool for agroforestry



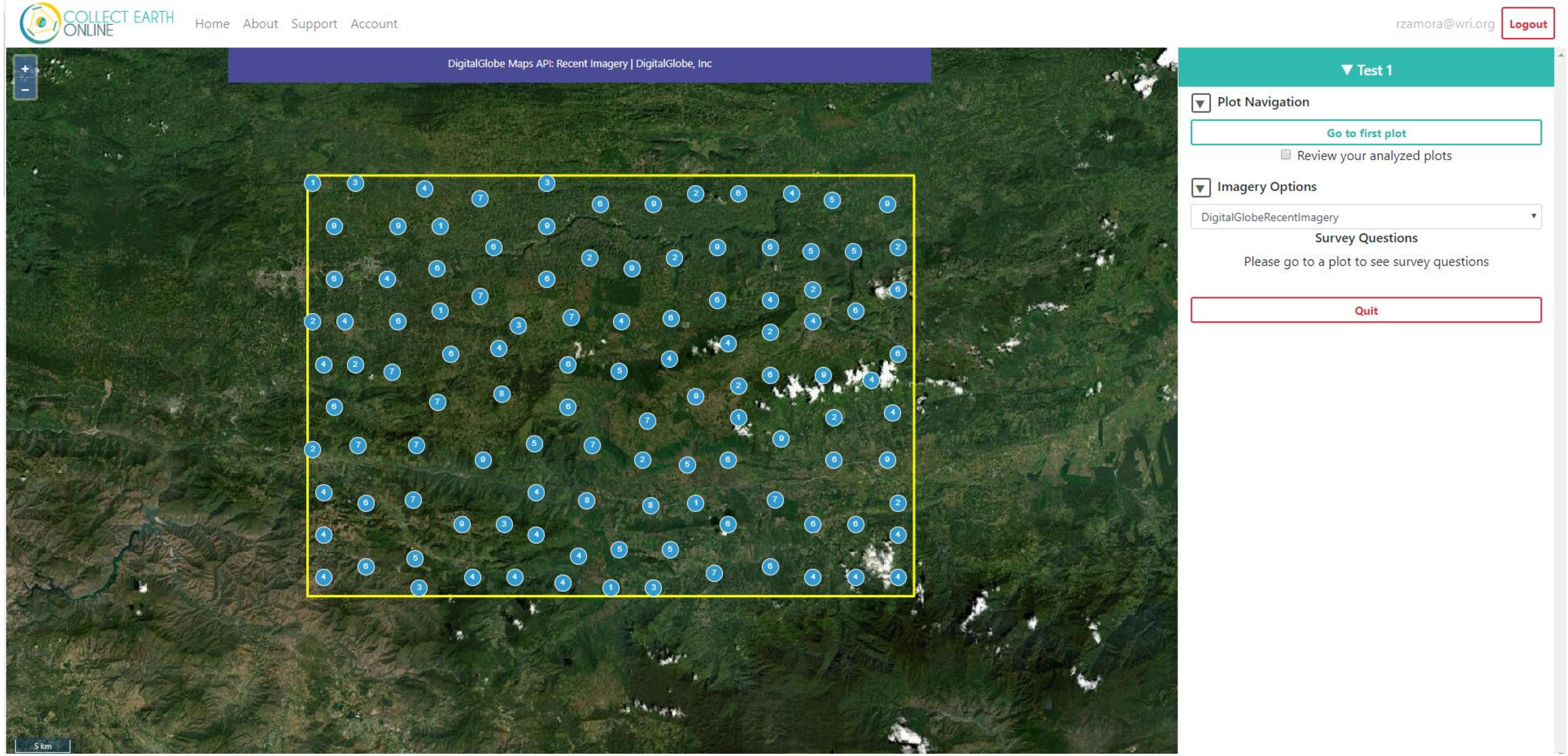
https://collect.earth/

Collect Earth creating account and Institution





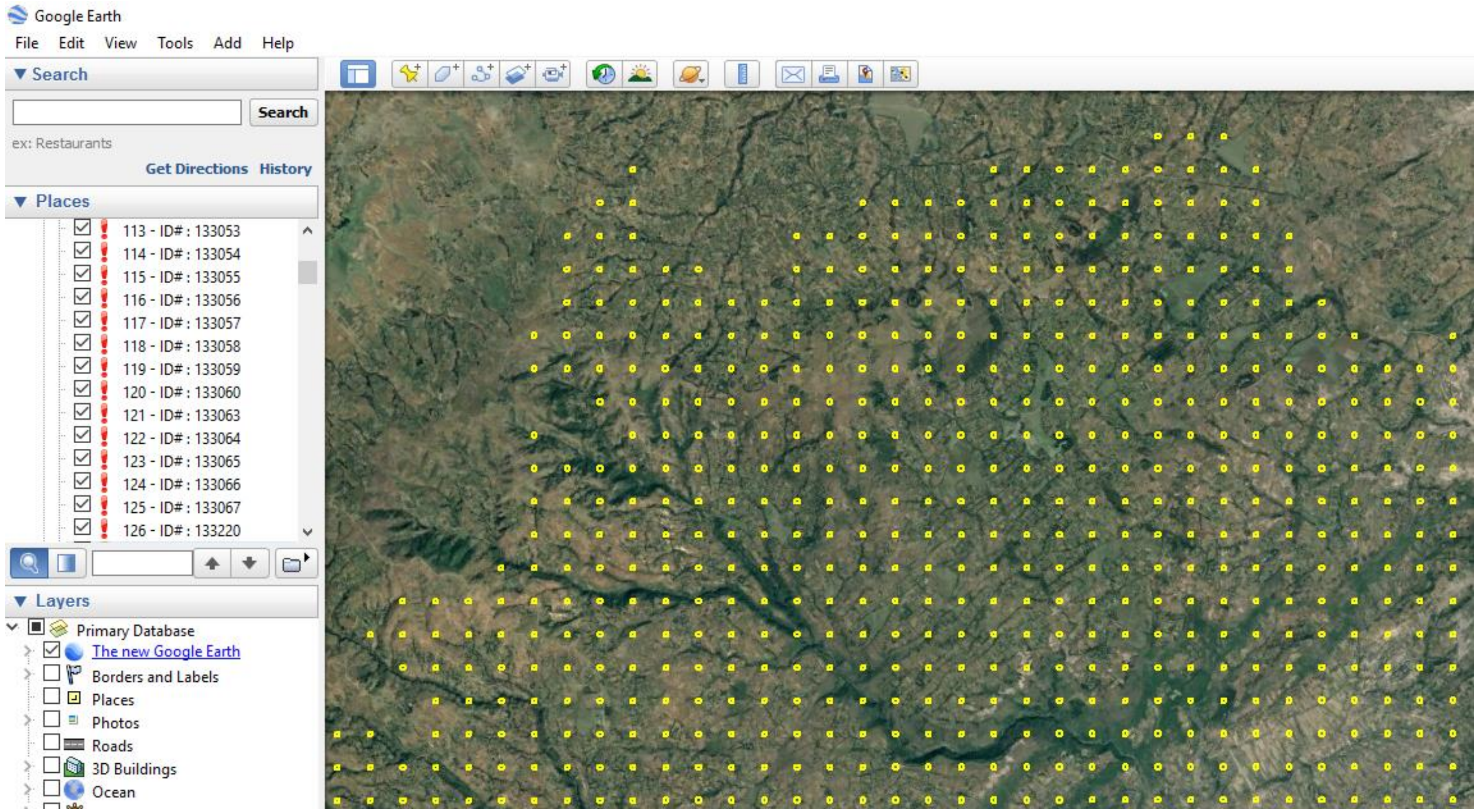
Proceso de Muestreo



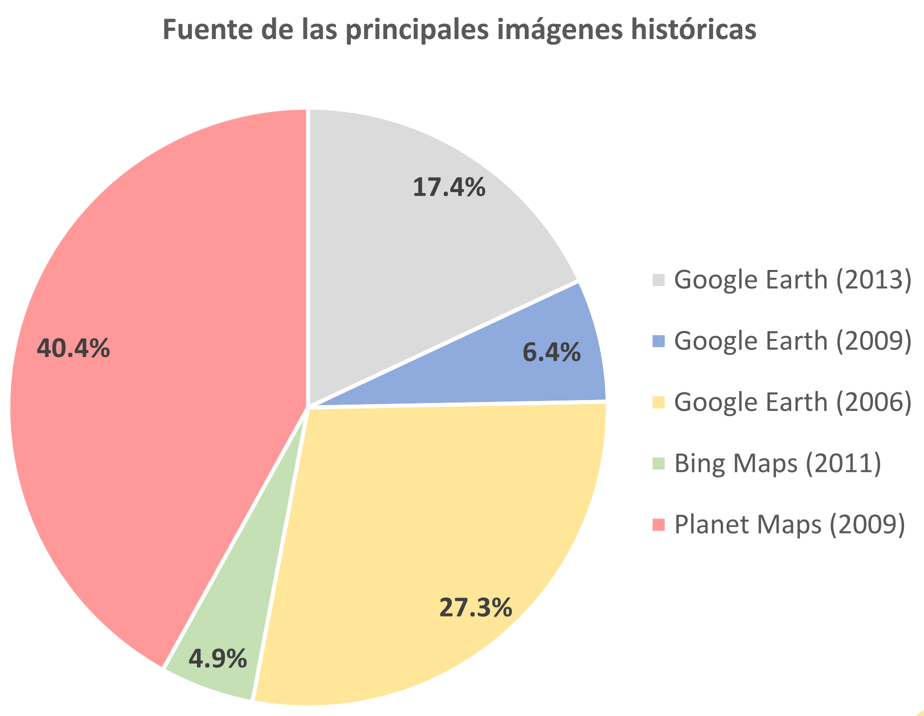
Parcelas


DigitalGlobe Maps API: Recent Imagery | DigitalGlobe, Inc
50 m
Download Plot KML
rzamora@wri.org
Logout
Test 1
Plot Navigation - ID: 135201034
Imagery Options
DigitalGlobeRecentImagery
Unanswered Color Black White
Survey Questions
1
2
Landcover
Forest
Agriculture
Settlement
Pastures
Save
Flag Plot
Clear All
Quit

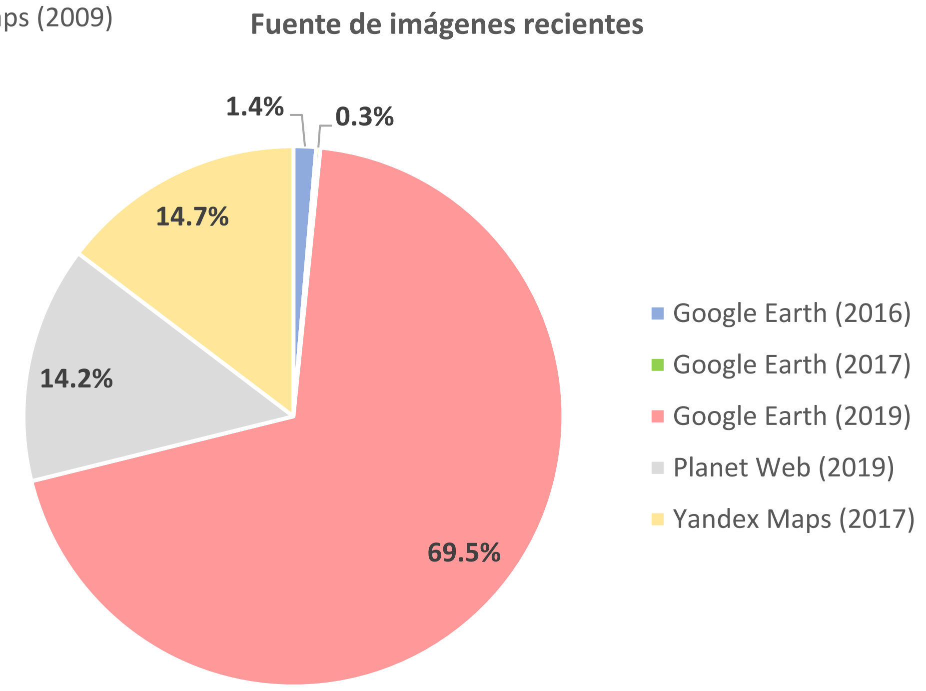
Grid Generation



Images



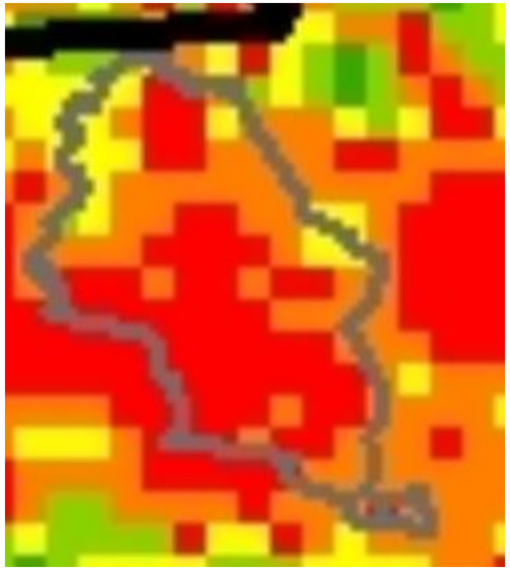
Fuente de las principales imágenes históricas
17.4%
6.4%
27.3%
4.9%
40.4%
Google Earth (2013)
Google Earth (2009)
Google Earth (2006)
Bing Maps (2011)
Planet Maps (2009)

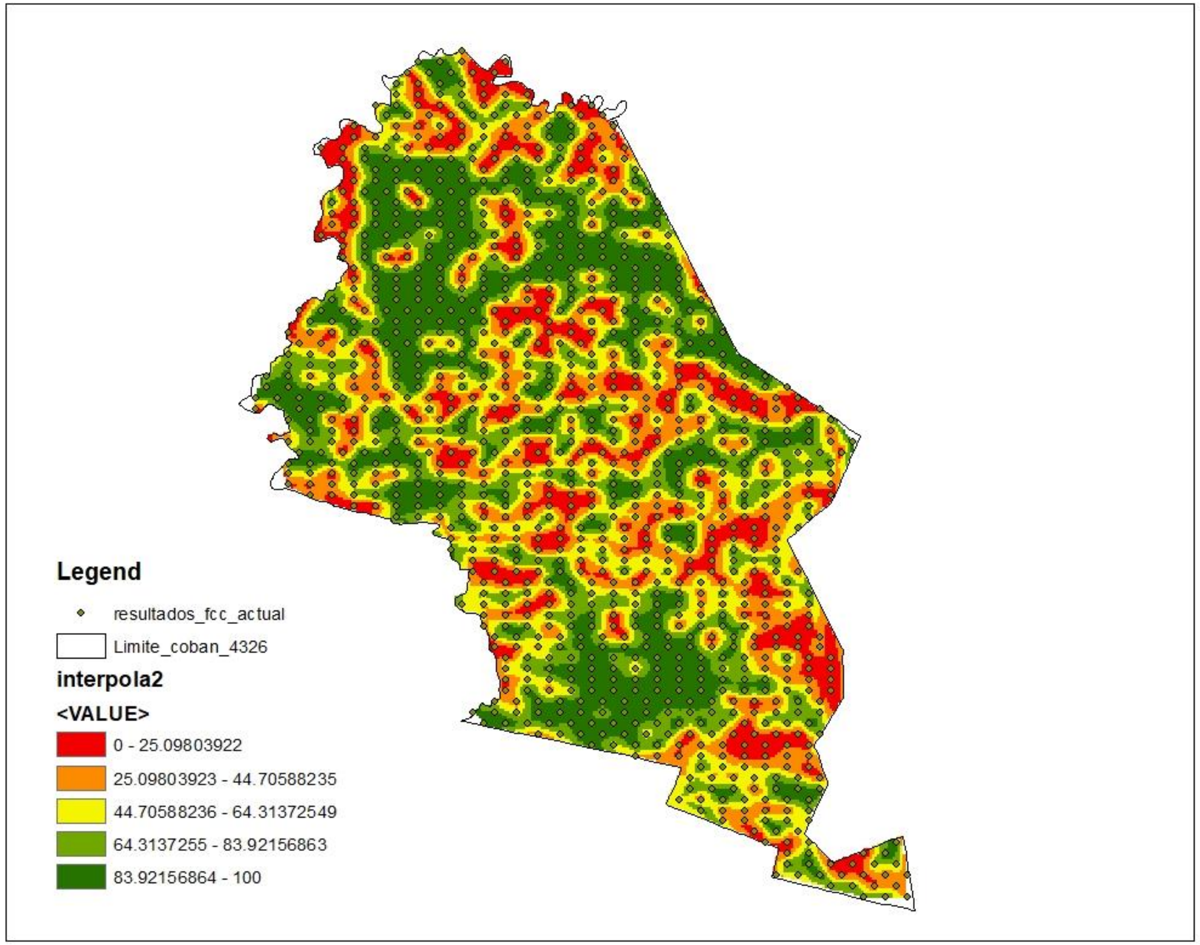


Fuente de imágenes recientes
1.4%
0.3%
14.7%
14.2%
69.5%
Google Earth (2016)
Google Earth (2017)
Google Earth (2019)
Planet Web (2019)
Yandex Maps (2017)

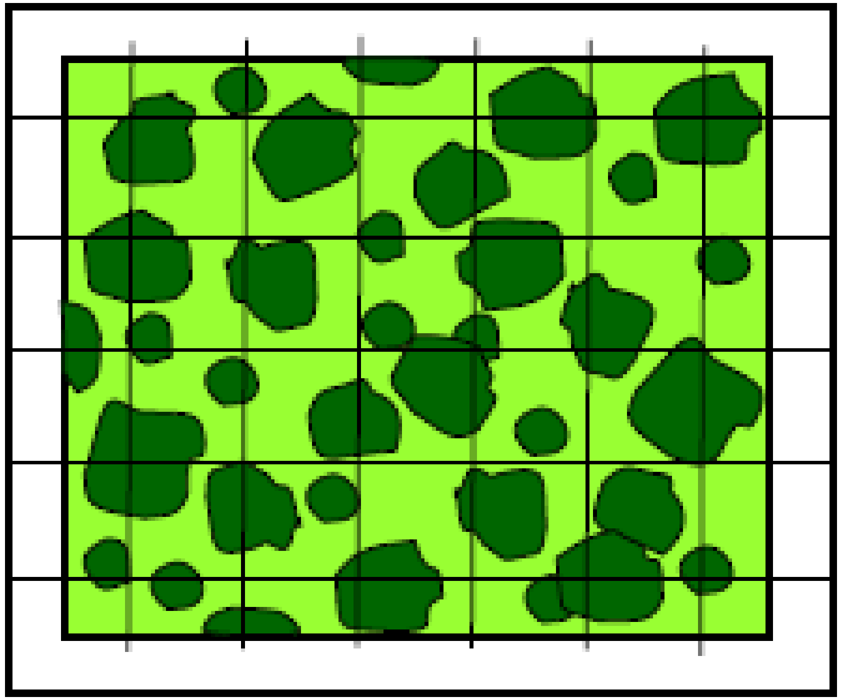
Cobertura	% OCUPACIÓN HISTÓRICA	% OCUPACIÓN ACTUAL	% DIFERENCIA	% AUMENTO O DISMINUCIÓN
Árbol natural	56.64	56.89	0.25	0.44
Arbusto matorral	14.90	12.32	-2.58	-17.32
Herbácea	11.06	9.37	-1.68	-15.23
Cultivo	11.87	12.60	0.73	6.18
Suelo desnudo	1.51	3.27	1.76	115.99
Árbol plantación	1.24	1.42	0.18	14.49
Construcción	0.86	1.27	0.41	48.13
Infraestructura	0.71	1.00	0.28	39.93
Agua	0.69	0.76	0.07	10.58
Corta arbolado	0.47	0.94	0.47	100.00
Nube	0.02	0.02	0.00	0.00
Otros conocidos	0.00	0.04	0.04	-
Otros desconocidos	0.00	0.05	0.05	-

Algunos resultados preliminares

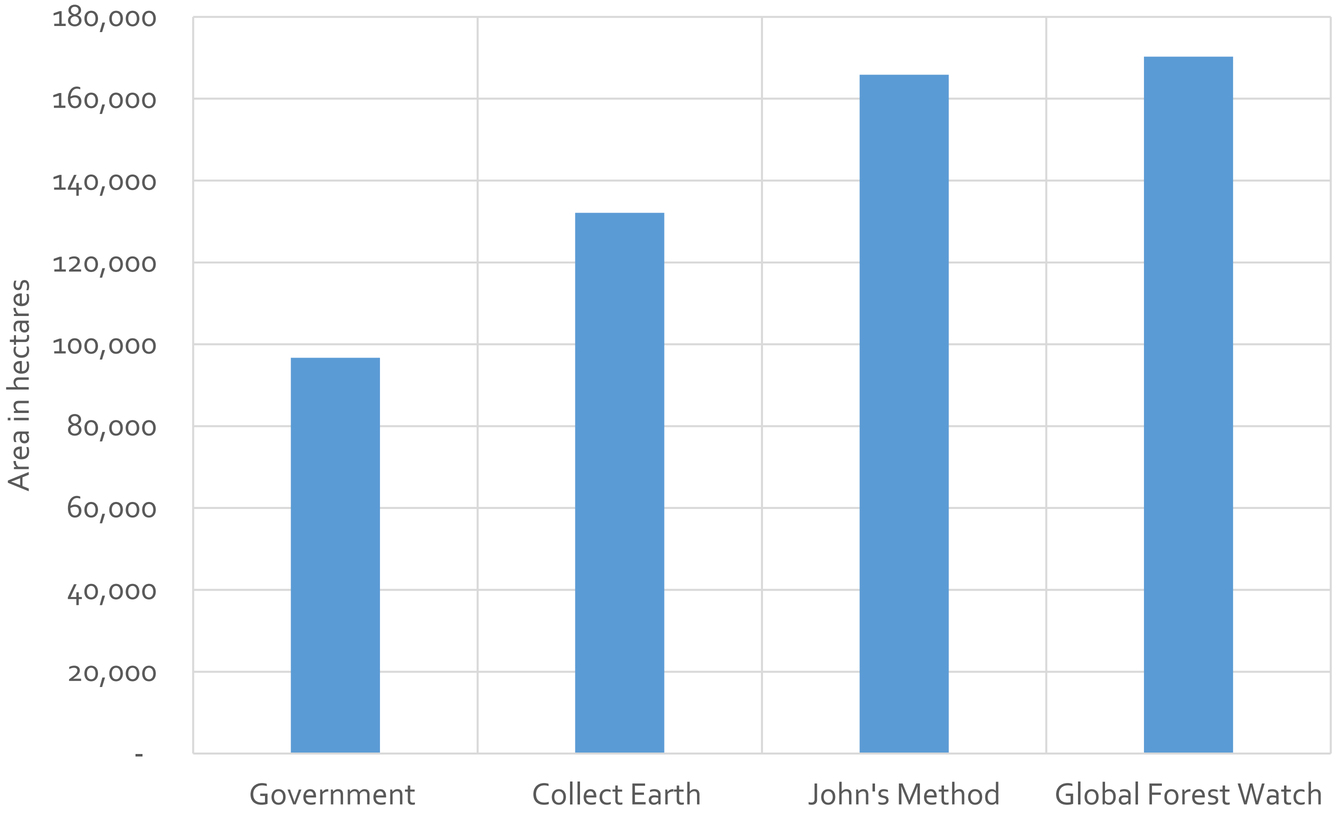




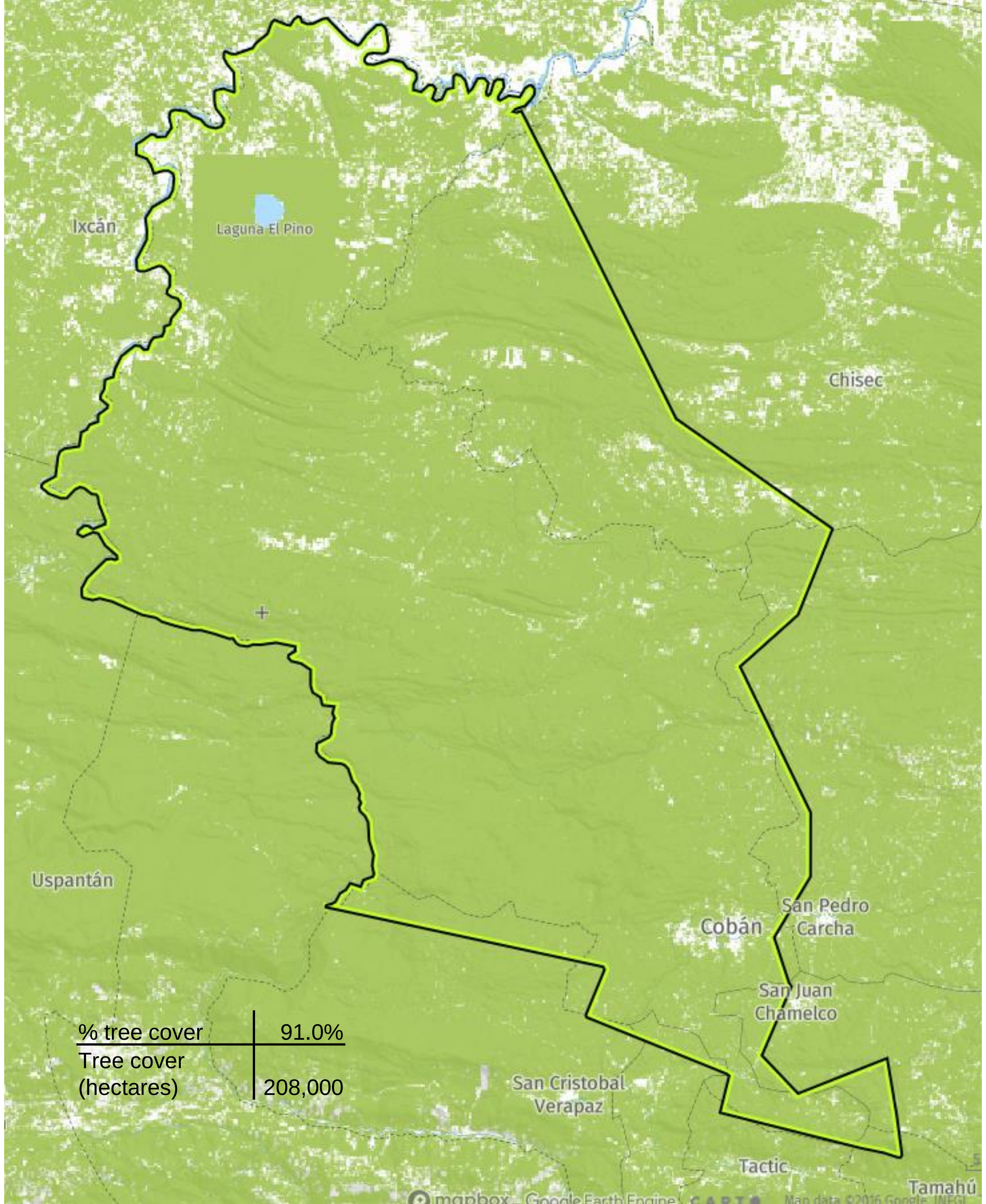
Tree cover



Preliminary Results actual Forest cover

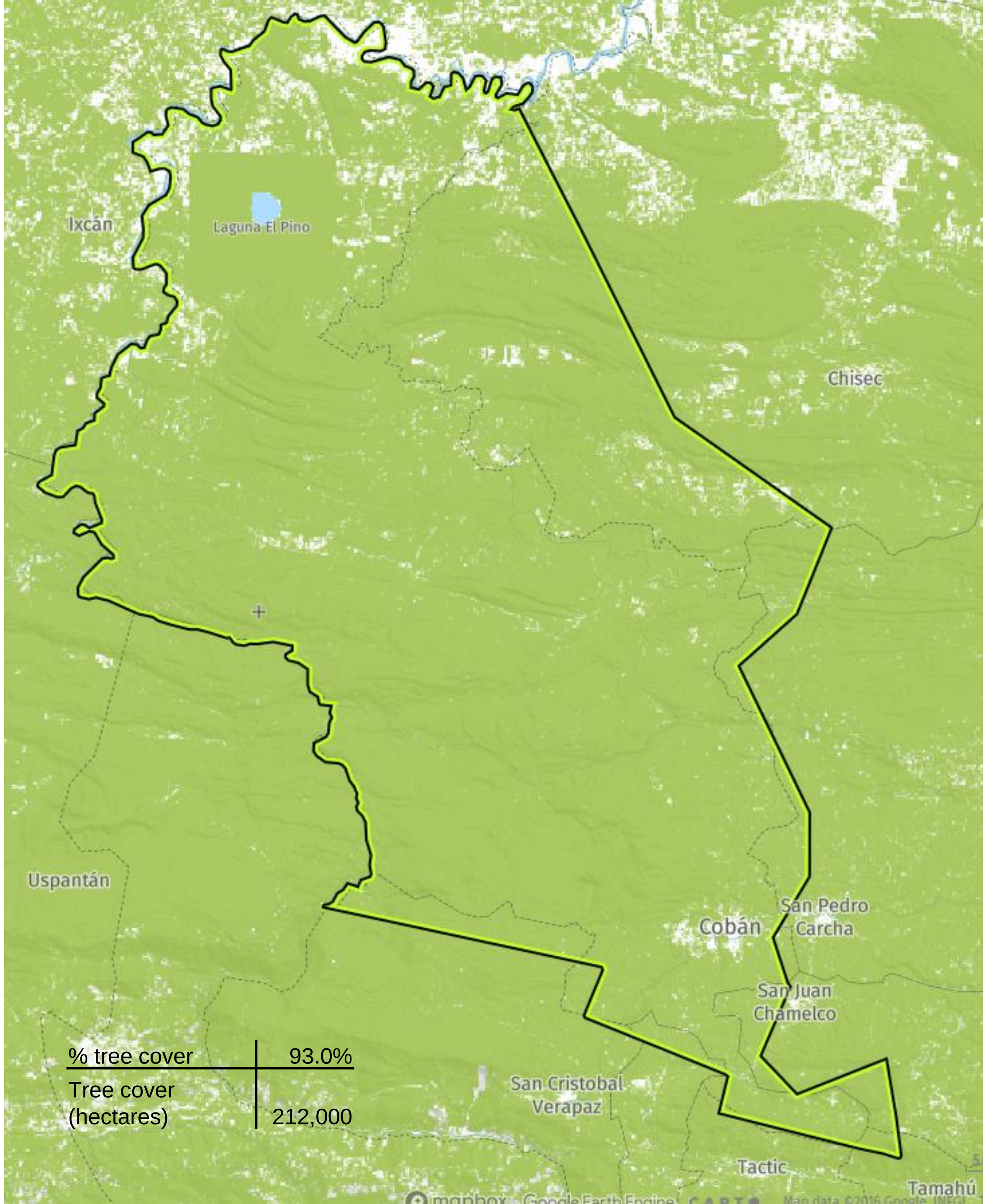


Global Forest Watch 2010 Tree Cover >30% canopy density

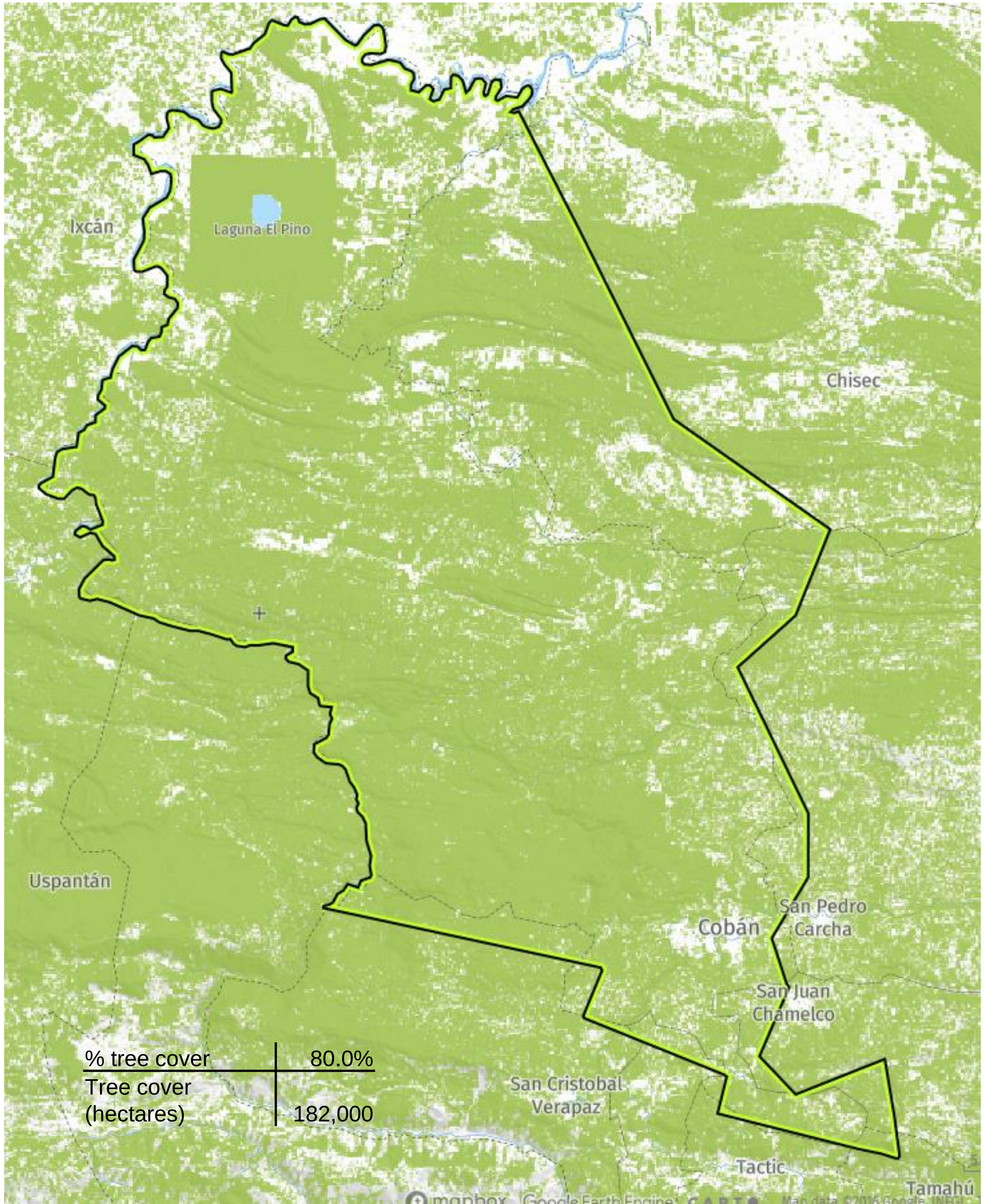


% tree cover	91.0%
Tree cover (hectares)	208,000

Global Forest Watch
2010 Tree Cover
>10% canopy density

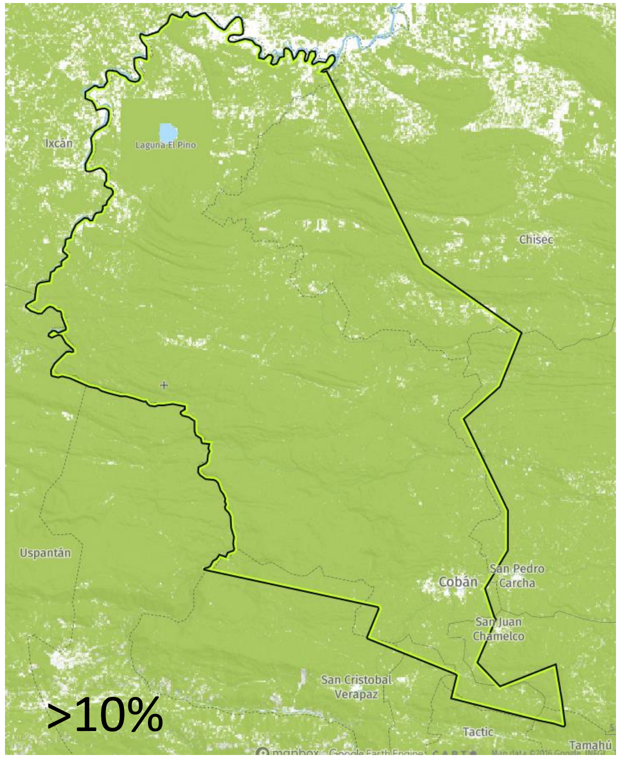


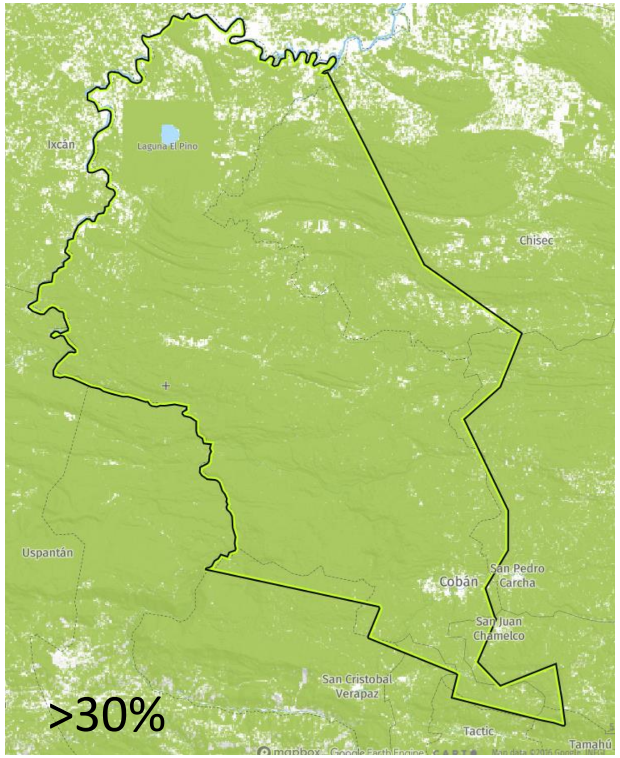
Global Forest Watch 2010 Tree Cover >75% canopy density

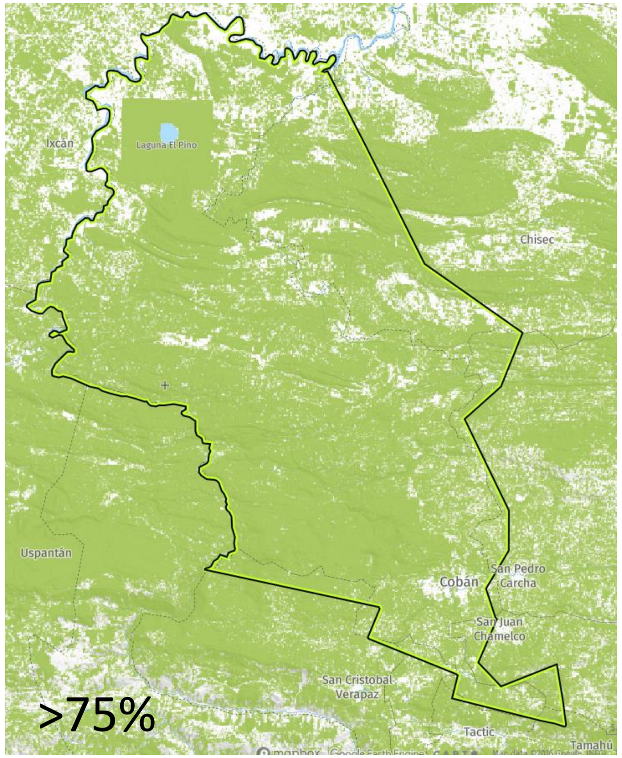


% tree cover	80.0%
Tree cover (hectares)	182,000

Global Forest Watch







	% tree cover	Tree cover (in hectares)	Year
Collect Earth	58.3%	132,127	2016-2019
GFW (>30%)	91.0%	208,000	2010
GFW (>10%)	93.0%	212,000	2010
GFW (>75%)	80.0%	182,000	2010
GFW (primary forest loss data)	81.0%	183,542	2019
AI Method	73.0%	164,848	
Government Data	43.3%	98,035	2016

SUBNATIONAL CODE	SUBNATIONAL NAME	Population	Total Forest Area (ha)	FLR Potential Area (ha)	PLANTATIONS & WOODLOTS (0-20y rate, tCO2e/ha/y)						NATURAL REGENERATION		MANGROVE TREE		MANGROVE SHRUB		AGROFORESTRY	
					teak	eucalyptus	other broadleaf	oak	pine	other conifer	0-20y rate, tCO2e/ha/y	20-60y rate, tCO2e/ha/y	0-20y rate, tCO2e/ha/y	20-60y rate, tCO2e/ha/y	0-20y rate, tCO2e/ha/y	20-60y rate, tCO2e/ha/y	0-20y rate, tCO2e/ha/y	20-60y rate, tCO2e/ha/y
SV.SM	**San Miguel**	566,638	102,089	**182,975**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.UN	**La Unión**	325,183	91,820	**179,700**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.SA	**Santa Ana**	667,607	103,546	**155,725**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.CH	**Chalatenango**	231,394	102,177	**148,850**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.US	**Usulután**	367,847	106,339	**144,600**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.LI	**La Libertad**	1,023,677	92,961	**105,575**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.MO	**Morazán**	195,911	79,664	**103,225**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.SV	**San Vicente**	196,021	53,254	**101,900**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.CA	**Cabañas**	166,032	57,002	**100,925**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.PA	**La Paz**	355,557	46,372	**94,850**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.SO	**Sonsonate**	587,187	66,402	**92,775**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.AH	**Ahuachapán**	397,744	66,834	**87,300**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**7.33**	**10.63**	**1.10**	**1.83**	**15.40**	**0.73**
SV.SS	**San Salvador**	2,598,652	41,312	**69,200**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**
SV.CU	**Cuscatlán**	256,715	41,920	**56,150**	**30.80**	**40.70**	**25.30**	**18.33**	**20.90**	**21.63**	**11.73**	**6.97**	**N/A**	**N/A**	**N/A**	**N/A**	**15.40**	**0.73**

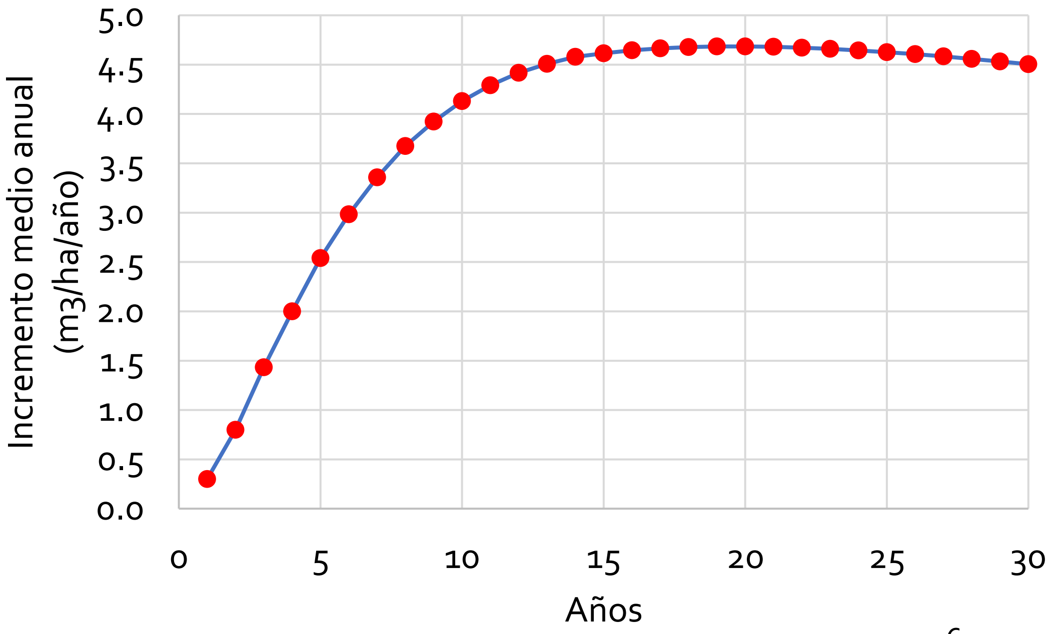
Algunas Transformaciones Básicas

Año	Acciones de Restaruración	Ha Restauradas	Factor TCO2e/ha/año	Años	Total TCO2e
2016	Ecosistema de Manglar / Restauración basada en aprovechamiento sostenible de los recursos naturales	1,640.00	6.35	3.00	31,242.00
	Conservación y aprovechamiento sostenible de bosques naturales	683.00	**11.73**	3.00	24,034.77
2017	Conservación y aprovechamiento sostenible de bosques naturales	4,261.80	**11.73**	2.00	99,981.83
	Café / Sistemas Agroforestales sostenibles (SAS)	1,006.60	4.20	2.00	8,455.44
	Ecosistema de Manglar / Restauración basada en aprovechamiento sostenible de los recursos naturales	338.80	6.35	2.00	4,302.76
	Sistema Diversificado Sostenible	3,293.00	4.70	2.00	30,954.20
	Manejo de rastrojos o gestión de residuos de cosechas	59.50	0.09	2.00	10.71
	Sistemas Agroforestales (SAF)	43.50	4.20	2.00	365.40
	Reforestación	250.00	**25.30**	2.00	12,650.00
2018	Conservación y aprovechamiento sostenible de bosques naturales	450.00	**11.73**	1.00	5,278.50
	Sistema Diversificado Sostenible	925.00	4.70	1.00	4,347.50

Year	m3/ha	ICA	Carbon per cubic meter	CO2 Eq	CO2Eq Captured	$/ha.year
1	0.3	0.3	0.1	0.27525	0.275	1.38
2	1.6	1.3	0.4	1.468	1.193	5.96
3	4.3	2.7	1.1	3.94525	2.477	12.39
4	8.0	3.7	2.0	7.34	3.395	16.97
5	12.7	4.7	3.2	11.65225	4.312	21.56
6	17.9	5.2	4.5	16.42325	4.771	23.86
7	23.5	5.6	5.9	21.56125	5.138	25.69
8	29.4	5.9	7.4	26.9745	5.413	27.07
9	35.3	5.9	8.8	32.38775	5.413	27.07
10	41.3	6	10.3	37.89275	5.505	27.53
11	47.2	5.9	11.8	43.306	5.413	27.07
12	53.0	5.8	13.3	48.6275	5.321	26.61
13	58.6	5.6	14.7	53.7655	5.138	25.69
14	64.1	5.5	16.0	58.81175	5.046	25.23
15	69.2	5.1	17.3	63.51671	4.705	23.52
16	74.3	5.1	18.6	68.1897	4.673	23.36
17	79.3	5.0	19.8	72.77094	4.581	22.91
18	84.2	4.9	21.1	77.26044	4.489	22.45
19	89.0	4.8	22.3	81.65818	4.398	21.99
20	93.7	4.7	23.4	85.96417	4.306	21.53
21	98.3	4.6	24.6	90.17841	4.214	21.07
22	102.8	4.5	25.7	94.30091	4.122	20.61
23	107.2	4.4	26.8	98.33165	4.031	20.15
24	111.5	4.3	27.9	102.2706	3.939	19.69
25	115.7	4.2	28.9	106.1179	3.847	19.24
26	119.8	4.1	29.9	109.8734	3.755	18.78
27	123.7	4.0	30.9	113.5371	3.664	18.32
28	127.6	3.9	31.9	117.1091	3.572	17.86
29	131.4	3.8	32.9	120.5894	3.480	17.40
30	135.1	3.7	33.8	123.9778	3.388	16.94

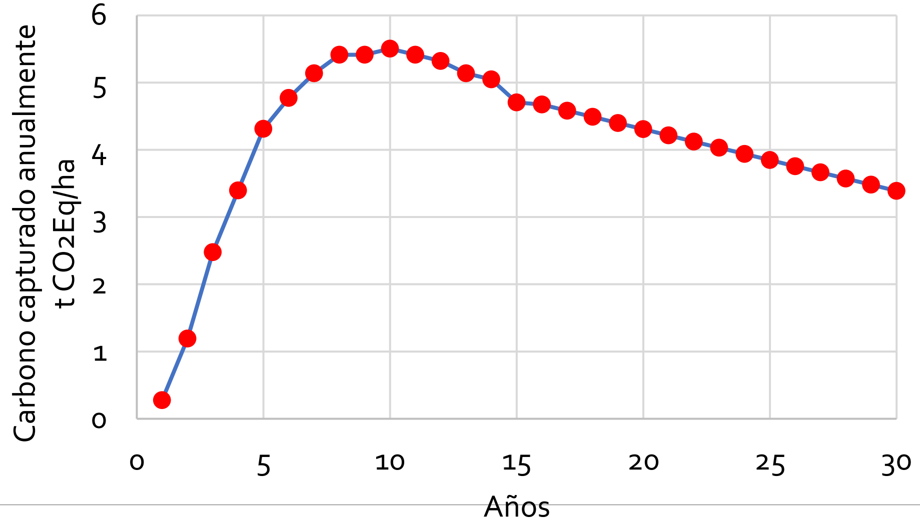
Masa seca	50%	of dry matter	
Densidad de la especie	0.5	t/m3	
Carbono por metro cubico	0.25		
CO2 Equivalent	3.67	tons of CO2/ton C	
Price of CO2Eq/tonne	5		

3PG model para medir crecimiento

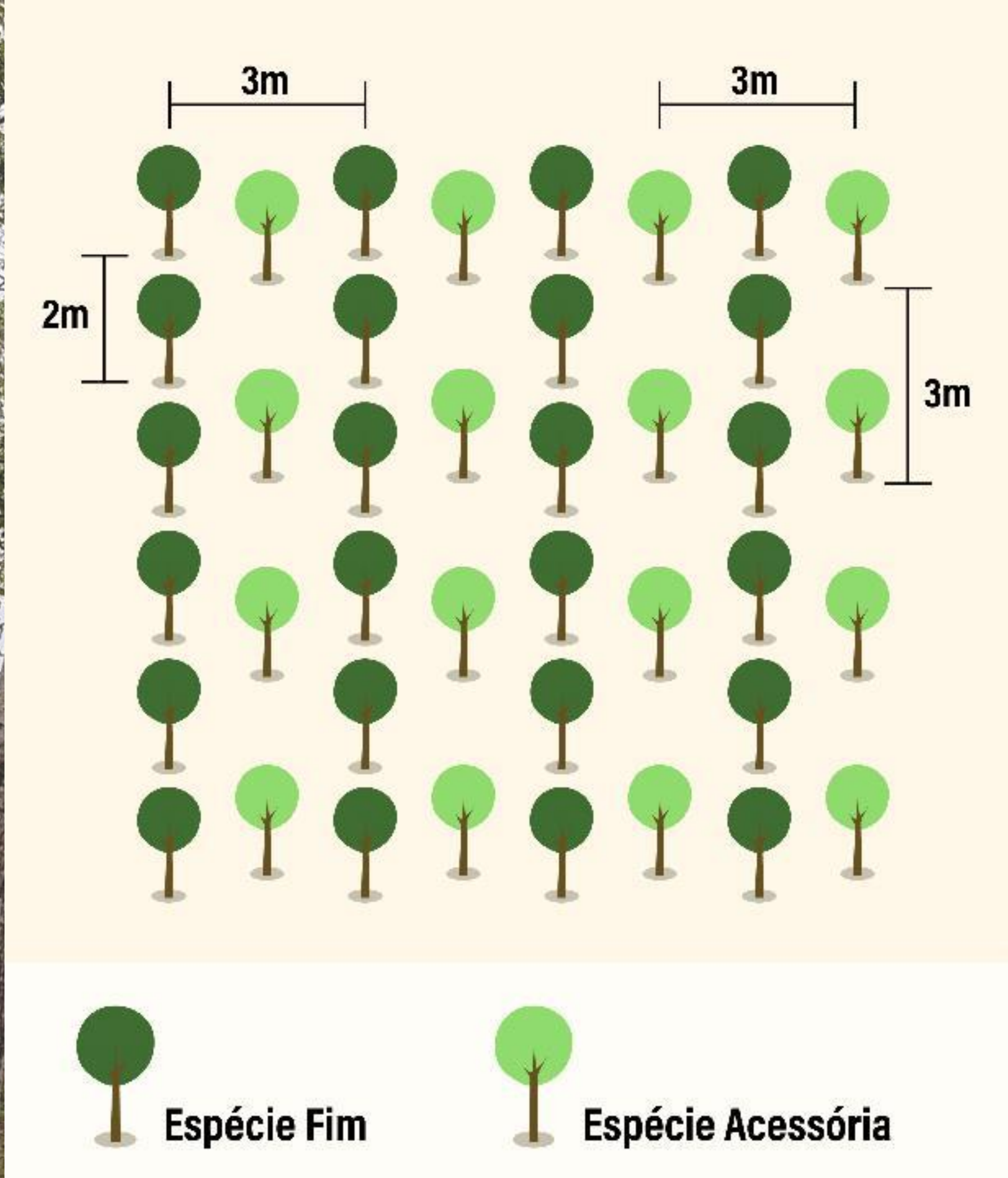


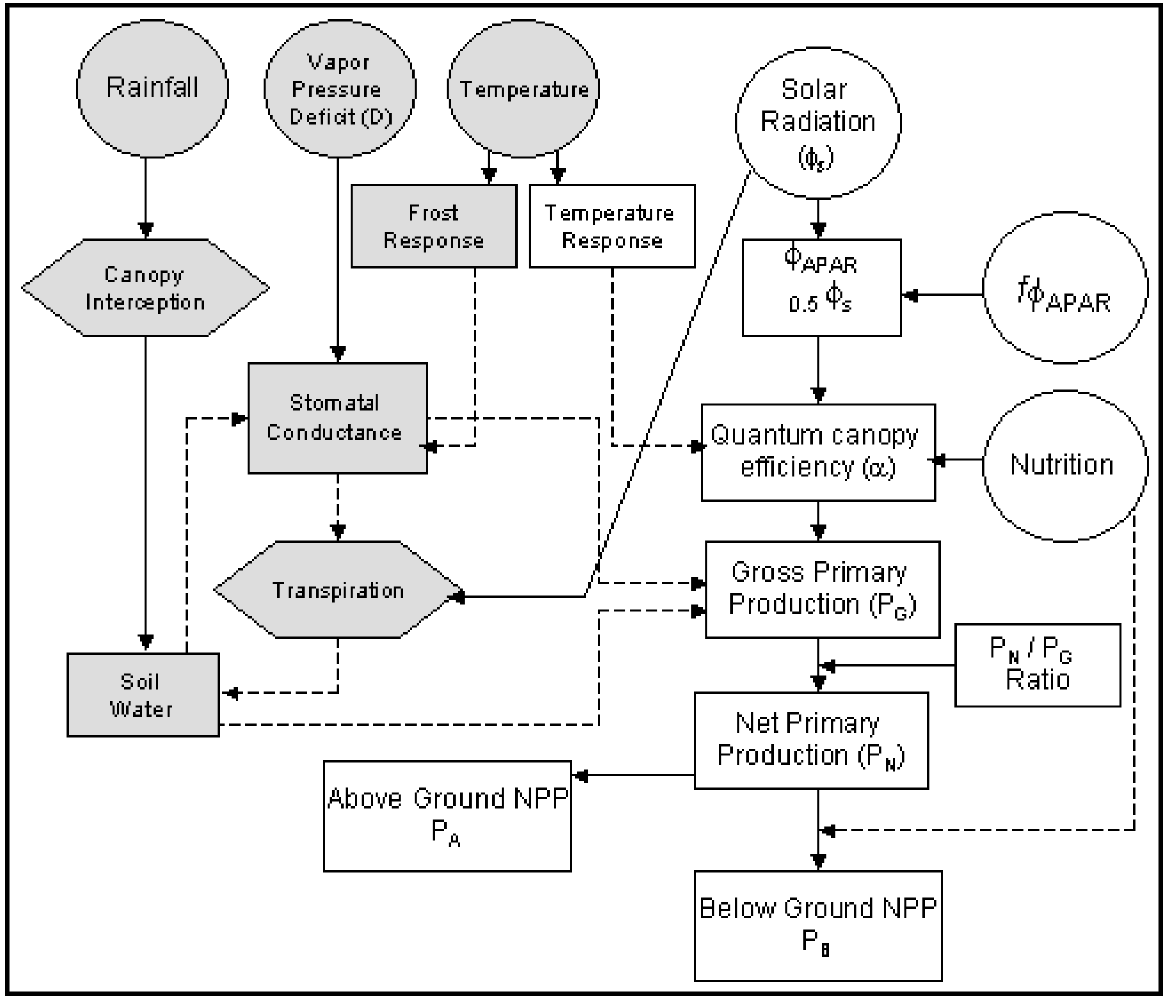
Vol x 50% x 0.5 t/m3

USD 5/ t CO2Eq



SYMBIOSIS





Rainfall
Vapor Pressure Deficit (D)
Temperature
Solar Radiation (ϕ_s)
Frost Response
Temperature Response
Canopy Interception
ϕ_{APAR} 0.5 ϕ_s
$f\phi_{APAR}$
Stomatal Conductance
Quantum canopy efficiency (α)
Nutrition
Transpiration
Gross Primary Production (P_G)
P_N / P_G Ratio
Soil Water
Net Primary Production (P_N)
Above Ground NPP P_A
Below Ground NPP P_B

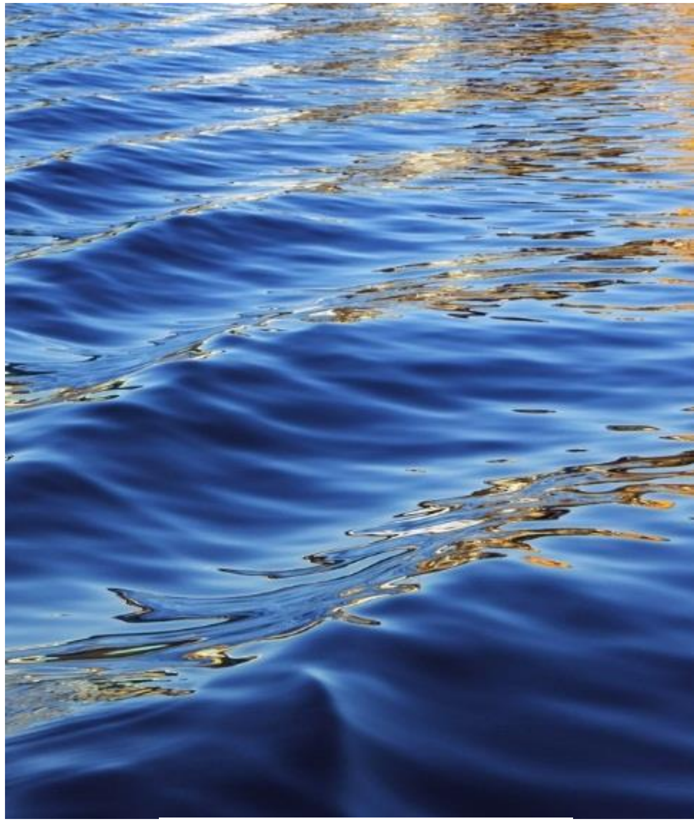
Dr. René Zamora-Cristales, WRI, rene.zamora@wri.org

Forest Economist & Senior Research Associate,
Latin America Research Coordinator,
Initiative 20x20
World Resources Institute

Assistant Courtesy Professor, Oregon State University

Initiative 20x20





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