

Changing forests & overlapping tenure in the Ecuadorian Amazon: Implications for the future implementation of SocioBosque

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Land Tenure and Forest Carbon Management, LTC Workshop,
University of Wisconsin-Madison, October 21-22, 2011

Rationale for research

- Deforestation in EC Amazon = resource extraction \times roads \times agricultural settlement
 - Indirect drivers = land tenure \times land settlement program (or policy)
 - Growing evidence that not only PAs, but indigenous reserves, community forests influence forest outcomes
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- Clear & secure land tenure = critical component for PES & REDD+
 - Lack of empirical understanding: land tenure & deforestation
 - Context-dependent, but key for design, prioritization & implementation of forest carbon management

Research questions

1. Is there a significant variation in forest change across different forms of tenure?
2. Are forest outcomes markedly different for areas where tenure overlaps exist?
3. How might these observed relationships inform the implementation of forest conservation incentives & forest carbon management in Ecuador?

SocioBosque in Ecuador



- Launched in 2008
- Two goals:
 - Conserve 36,000 km² of forest (+ other native ecosystems)
 - Safeguard livelihoods & improve income for 0.5 – 1.5 million people
- Incentive agreements: voluntary cash payments per hectare of forest enrolled
- Individual or communal title (indigenous): clear & uncontested
- Initially, lands within PAs NOT eligible (now YES)
- Spatial prioritization for implementation, defined as:
 - Deforestation threat
 - ES provision (carbon storage, water regulation, habitat for biodiversity)
 - Degree of poverty (unsatisfied basic needs (UBN) index)
 - Currently targeting priorities # 1 & 2

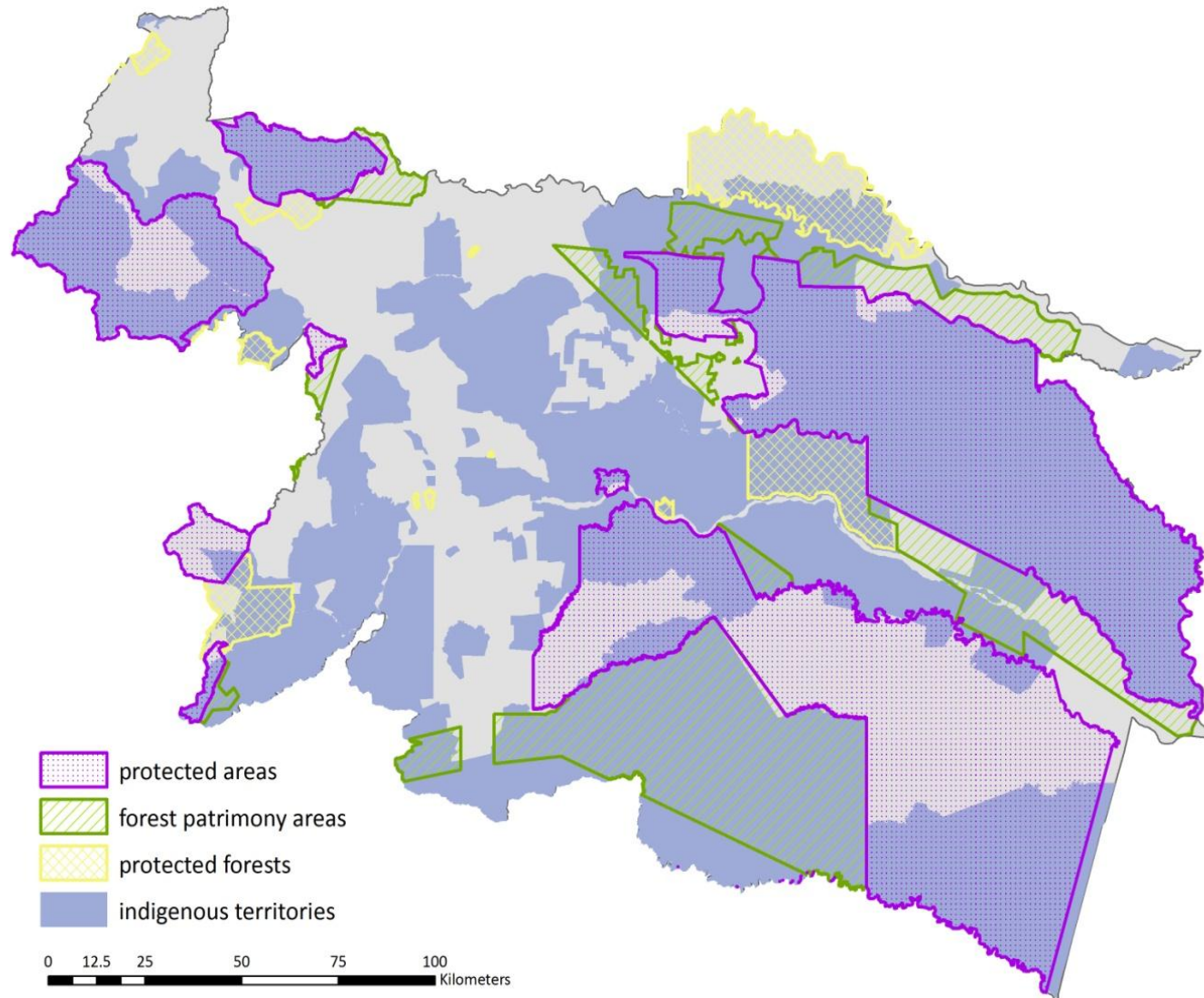
Study area

- Northern Ecuadorian Amazon:
 - Two provinces: Orellana & Sucumbíos
 - 39,763 km²
- Discovery of oil in 1967
- Agrarian Reform & Colonization (1964 & 1973), rapid increase in human population
- Rapid road construction

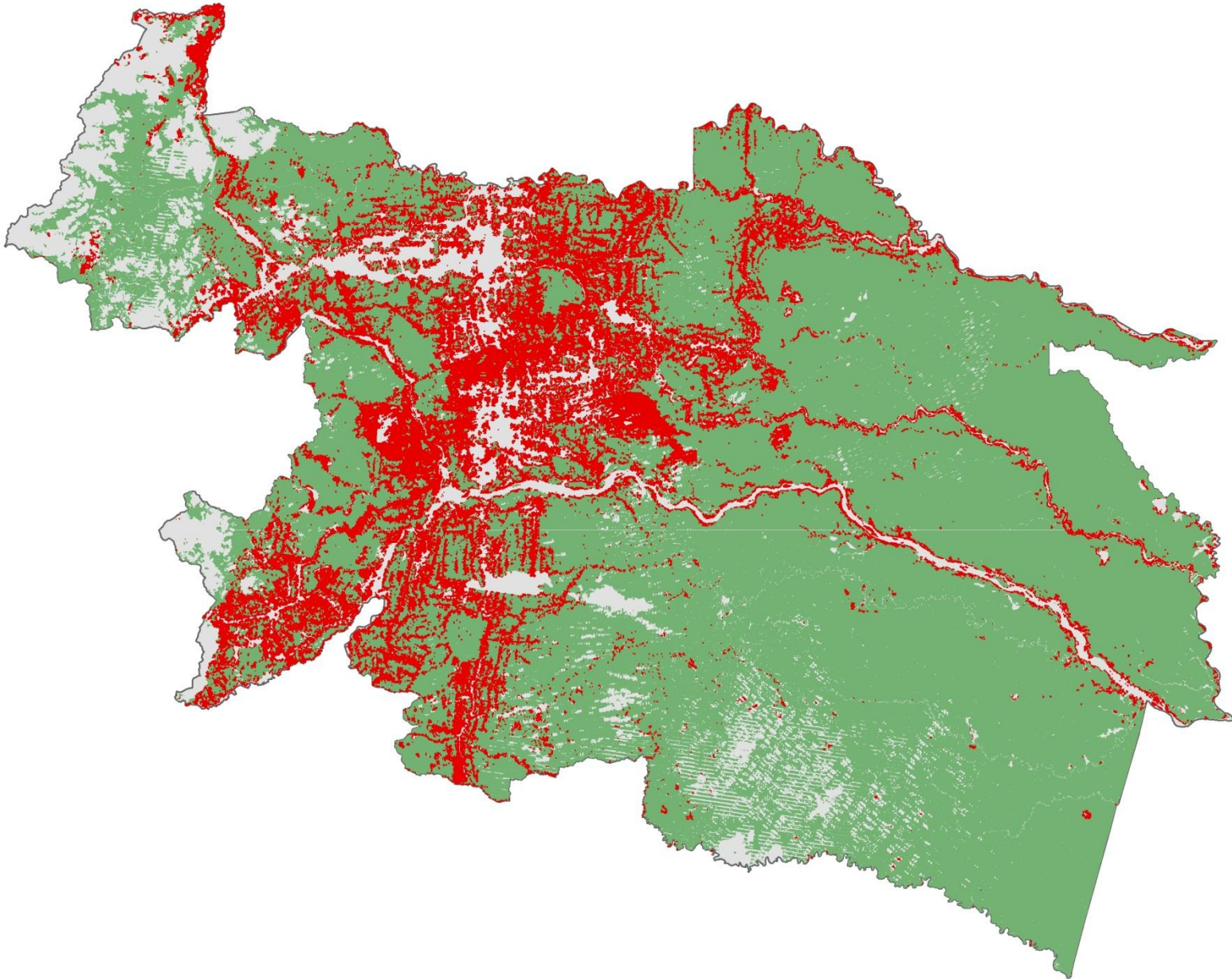


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- **1990 – 2000:**
 - Political & economic turmoil
 - Increased pressure to exploit petroleum
 - Oil & population boom
 - **2000 – 2008:**
 - Structural reform & dollarization
 - Continued political instability until 2007 (Correa administration)
 - 2008: new Constitution & SocioBosque
 - Population growth slowed (2011 census)

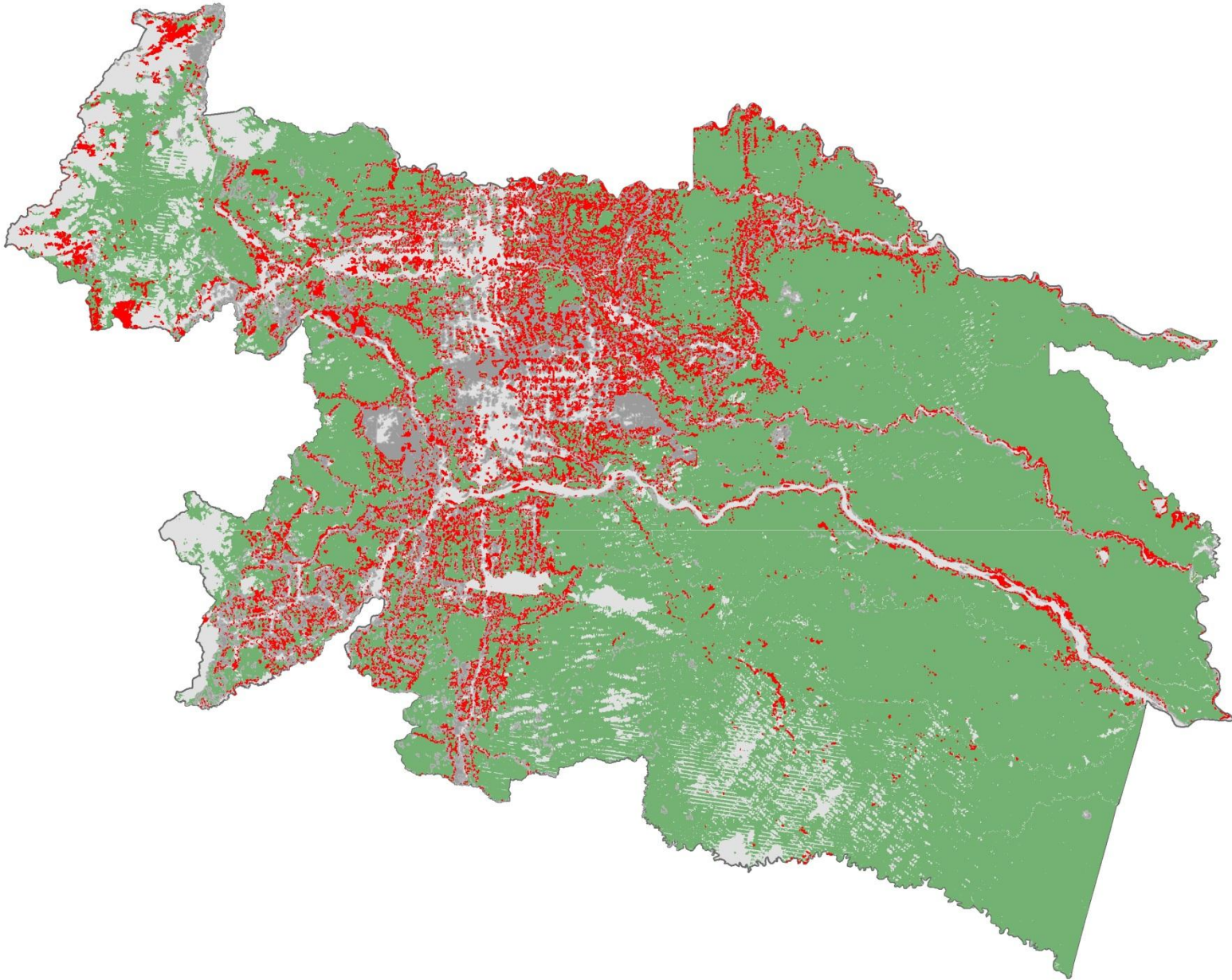
Tenure categories: challenges in defining “clean” forms



Deforestation in study region: 1990 – 2000



Deforestation in study region: 2000 -2008



Forest change by tenure category	Total area (km ²)	Forest base (km ²)	% De-forested	Defor/yr	Fractional loss of defor
1990-2000					
Study region	39,762.7	33,606.8	12.1	408.0	-1.3
Protected area (PA)	5,717.0	5,381.5	0.9	4.9	-0.1
PA-INDIG (overlap)	8,375.6	7,477.5	1.8	13.4	-0.2
Forest patrimony (PF)	1,588.8	1,472.8	6.0	8.8	-0.6
PF-INDIG (overlap)	4,261.4	3,564.9	3.8	13.7	-0.4
Protected forest (BP)	272.8	164.8	19.0	3.1	-2.1
BP-INDIG (overlap)	804.9	738.5	12.1	8.9	-1.3
Indigenous	10,215.8	8,549.8	21.7	185.8	-2.4
Private-MAGAP	8,564.5	6,278.4	27.0	169.4	-3.1
2000-2008					
Study region	39,762.7	29,966.5	3.8	141.9	-0.5
Protected area (PA)	5,995.2	5,088.6	0.5	3.1	-0.1
PA-INDIG (overlap)	9,020.8	7,883.0	1.5	15.0	-0.2
Forest patrimony (PF)	1,588.8	1,392.2	2.8	4.8	-0.4
PF-INDIG (overlap)	4,261.4	3,476.3	1.5	6.5	-0.2
Protected forest (BP)	272.8	140.1	7.1	1.2	-0.9
BP-INDIG (overlap)	858.8	695.0	2.6	2.3	-0.3
Indigenous	9,519.7	6,307.4	6.5	51.4	-0.8
Private-MAGAP	8,286.2	4,616.4	10.0	57.5	-1.3

Predictors of Deforestation: the effect of land tenure

Fixed effects at municipality level

Protected area (PA)	-0.44 (2.75)
PA + Indigenous	-4.00 (1.26) ***
Forest patrimony (PF)	-1.66 (1.36)
PF + Indigenous	-3.68 (1.56) **
Protected forest (BP)	-1.99 (3.36)
BP + Indigenous	0.73 (3.78)
Indigenous (only)	-1.08 (1.09)
Constant (Private land in period 1)	59.15 (4.33) ***
2000-2008 period	-27.75 (0.74) ***
covariates included ¹	yes
Random effects: tenure	yes
Random effects: + other covariates ²	yes
log likelihood	-240526
n	56564

1 = total percent forest and distance variables(road, population center, river, mine, oilfield)

2= total percent forest and distance variables(road, population center, river, mine, oilfield)

Predictors of Deforestation: the effect of land tenure

Fixed effects at municipality level	Model I	Time period	Model II
Protected area (PA)	-0.44 (2.75)	1	-1.76 (2.71)
		2	0.75 (2.71)
PA + Indigenous	-4.00 (1.26) ***	1	-6.13 (1.28) ***
		2	-2.08 (1.27)
Forest patrimony (PF)	-1.66 (1.36)	1	-5.56 (1.40) ***
		2	2.32 (1.40) *
PF – Indigenous	-3.68 (1.56) **	1	-5.75 (1.59) ***
		2	-1.53 (1.59)
Protected forest (BP)	-1.99 (3.36)	1	-2.61 (3.68)
		2	-1.33 (3.68)
BP – Indigenous	0.73 (3.78)	1	-0.31 (3.79)
		2	1.61 (3.75)
Indigenous (only)	-1.08 (1.09)	1	-0.69 (1.13)
		2	-1.61 (1.13)
Constant (Private land in period 1)	59.15 (4.33) ***		58.90 (4.38) ***
2000-2008 period	-27.75 (0.74) ***		-27.25 (0.75) ***
covariates included ¹	yes		yes
Random effects: tenure	yes		yes
Random effects: + other covariates ²	yes		yes
log likelihood	-240526		-240426
n	56564		56564

1 = total percent forest and distance variables(road, population center, river, mine, oilfield)

2= total percent forest and distance variables(road, population center, river, mine, oilfield)

Implications for SocioBosque

	Priority 1	Priority 2
Total area (km ²)	8,651.7	11,701.3
Forest base, 1990 (km ²)	7,237.7	9,607.3
Forest base, 2000 (km ²)	6,269.0	7,957.7
% deforested, 1990-2000	14.5	18.9
% deforested, 2000-2008	5.9	5.4
% area in tenure categories		
Protected forest (BP)	2.3	0.5
BP-INDIG	3.4	3.8
Forest patrimony (PF)	9	4.3
PF-INDIG	13.6	16.3
Indigenous	38.3	41.9
Private-MAGAP	32.8	33.3

- **2008-2011:** 195 (individual) & 16 (community) agreements
- Deforestation slowed *before* active implementation

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- Tenure form can play a role in slowing | accelerating forest loss
 - Opportunity with forest patrimony (PF) (and overlap with indigenous) areas (yet 10% these lands lack title, a ntl level)
 - Issue of additionality: close monitoring needed

Broader lessons for research moving forward?

- The relationship between tenure form & forest change = complex & dynamic
- The form of tenure does matter and its relationship can shift
- Overlapping forms did not signal increased forest loss
- Looking beyond deforestation effectiveness

Thank you!

Institutional affiliations



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TOGETHER. FOR THE PLANET.



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