Baselines for Deforestation Projects

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**Promoting Transformation by
Linking Natural Resources,
Economic Growth, and
Good Governance**

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Challenges for Deforestation

- Deforestation baselines are counterfactual
  - Satellite technology works
  - Good modeling techniques exist
  - Carbon stocks can be measured and monitored
- Projects will be needed nested within the country level approach in order to reduce deforestation
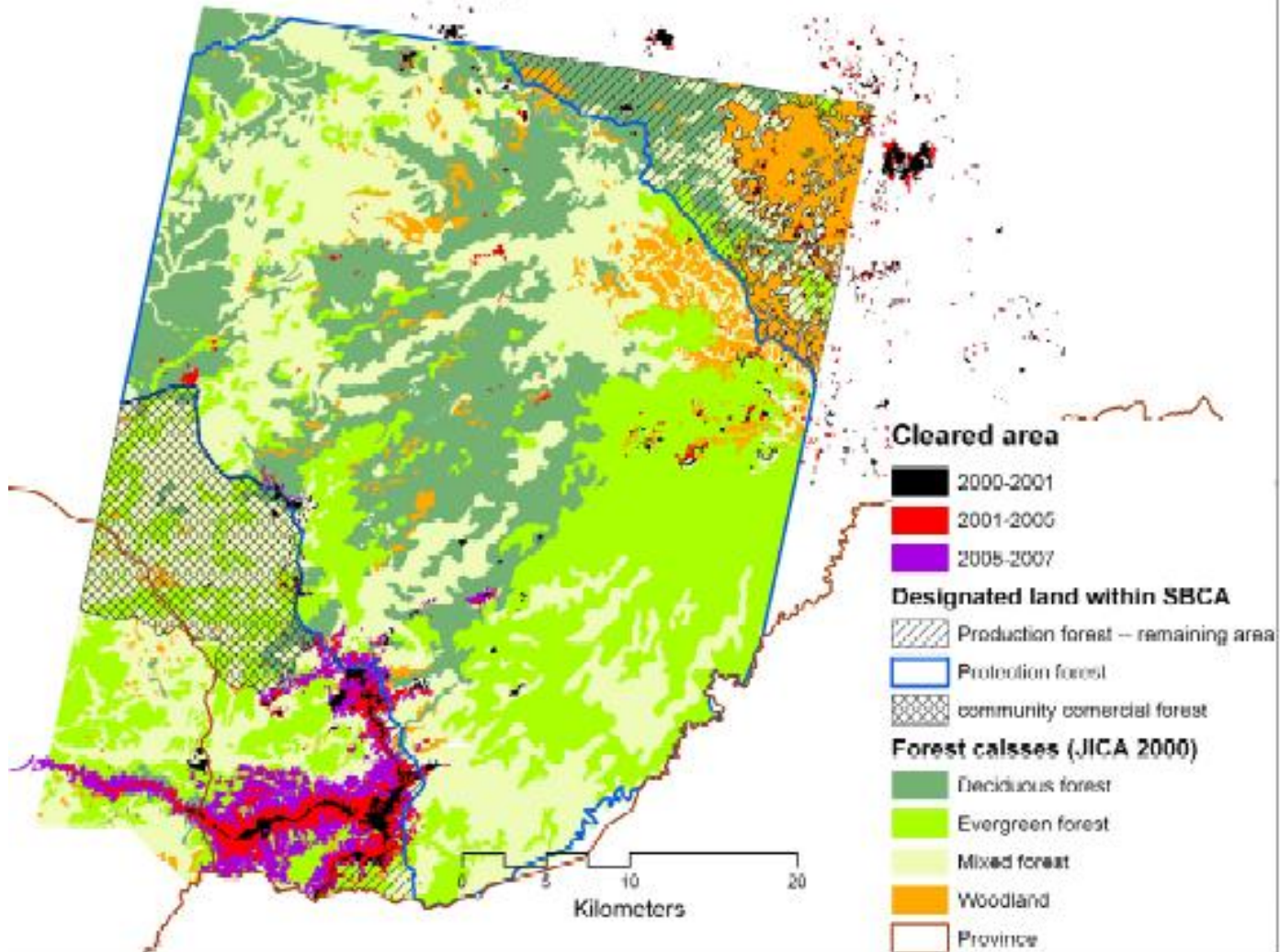
Rate of Deforestation

- History to predict future
- Satellite imagery or aerial photographs from at least three points in time
- Regression analysis?
- Impact of new roads, new Government policies?
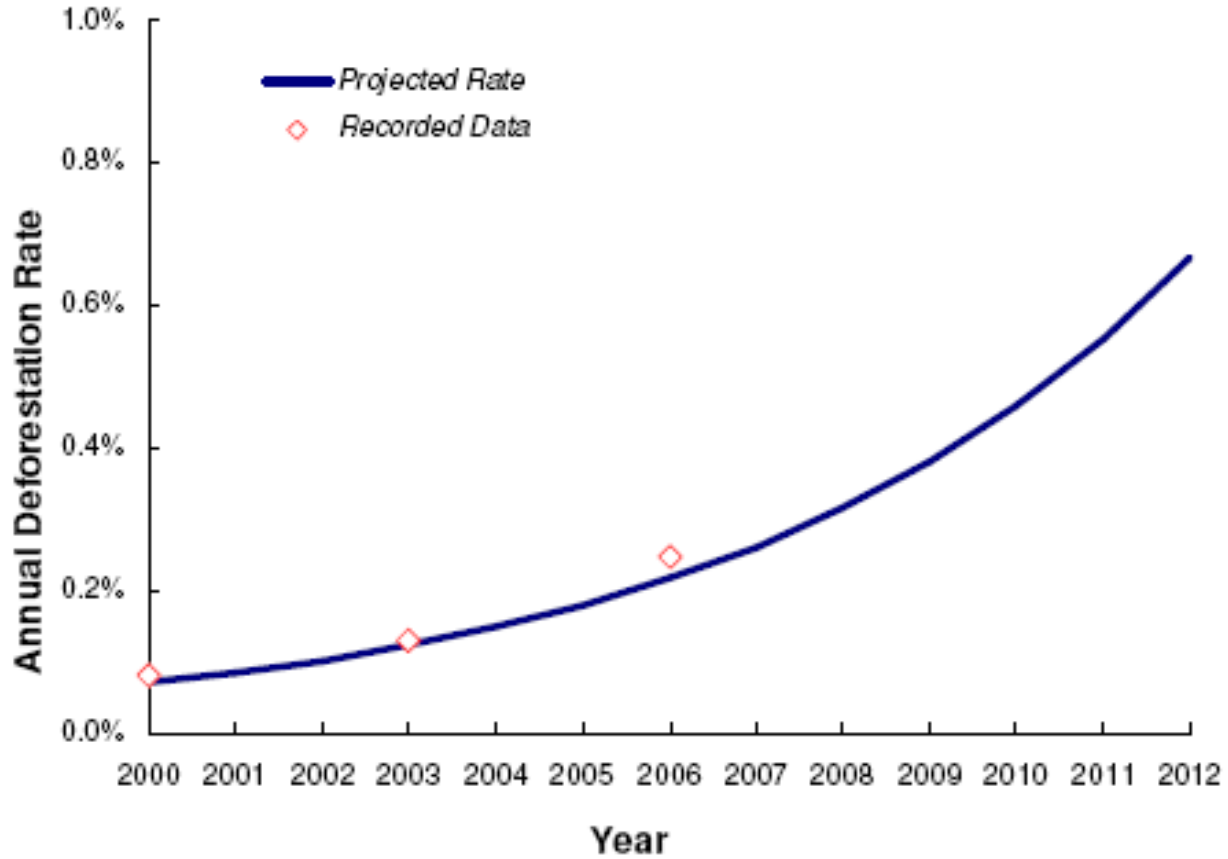- Never project out more than 10 years

Cleared area
- 2000-2001
- 2001-2005
- 2005-2007

Designated land within SBCA
- Production forest -- remaining area
- Protection forest
- community comercial forest

Forest calsses (JICA 2000)
- Deciduous forest
- Evergreen forest
- Mixed forest
- Woodland
- Province

Kilometers
0 5 10 20

- Step 1 – how much deforestation?
- Step 2 – where will the predicted deforestation occur
  - Spatial modeling / GEOMOD

Many variables affect spatial pattern of forest and non-forest lands

| Type of spatial data / Variable	Examples
Infrastructure	Distance to centers of government/commerce Distance to towns and communities Distance to roads (primary, secondary, all) Political district
Biophysical	Elevation Slope Aspect Watershed Precipitation Temperature Distance to major rivers/navigable water Presence of wetlands Soil
Biological	Vegetation type Ecozone
Human Disturbance	Distance to logging camps Distance to forest edge Distance to previously cultivated areas Distance to previously deforested land
Socionomic/Demographic	Land tenure Density of land-based economic sector of population % marginalized population

No one set of proxy drivers explains patterns of deforestation

Driver Sets Giving Best 'Goodness of Fit'

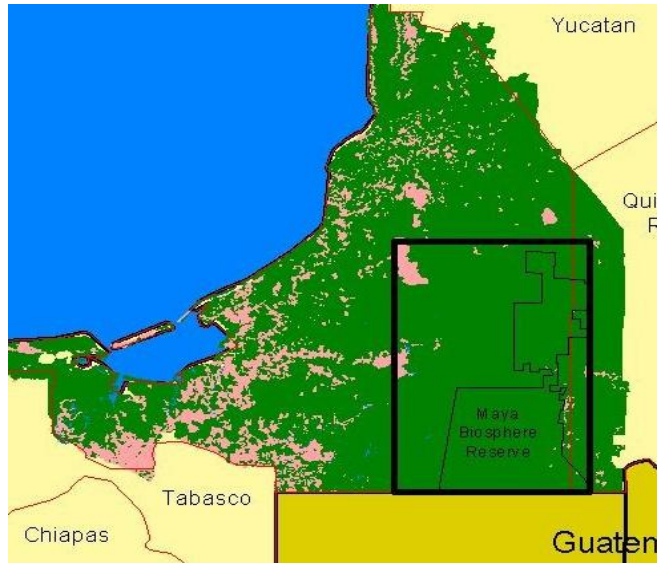|	Noel Kempff	Guaraquecaba	Rio Bravo	Chiapas
Elevation	0.15	0.15	0.13	
Slope	---	0.07	---	
Aspect	---	0.04	---	
Roads*	0.12	0.13	# 0.06	0.21
Rivers*	---	0.05	---	
Navig.Water*	0.12	0.08	---	
Political District	---	0.08	---	
Watershed	---	0.09	---	
Deforested Land *	0.08	0.11	0.24	0.19
Communities*	0.09	0.04	0.16	
Centers of Commerce*	0.07	---	0.21	
Forest Edge *	0.14	---	---	
Soils	---	0.15	---	
Main Roads*	---	---	0.20	
WWF Ecozones	0.15	---	---	
Logging Camps*	0.09	---	---	
Ag. Pop. Density				0.21
Marginalization				0.20
Land Tenure				
LULC Distribution				0.19

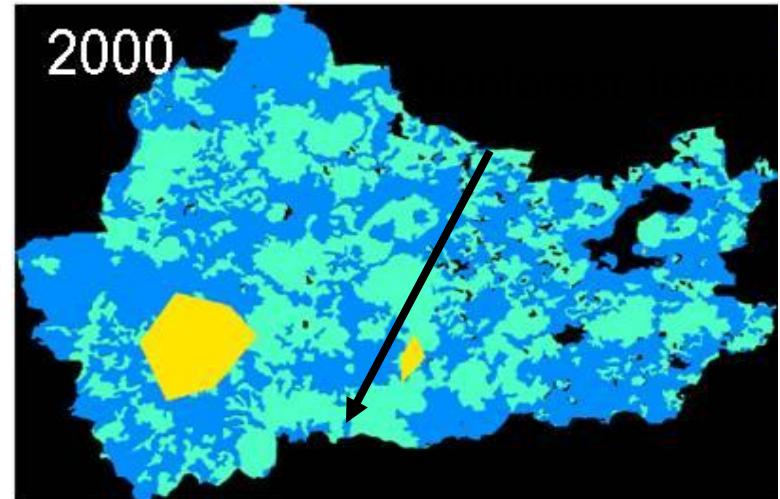# Examples of proxy drivers of land-use change
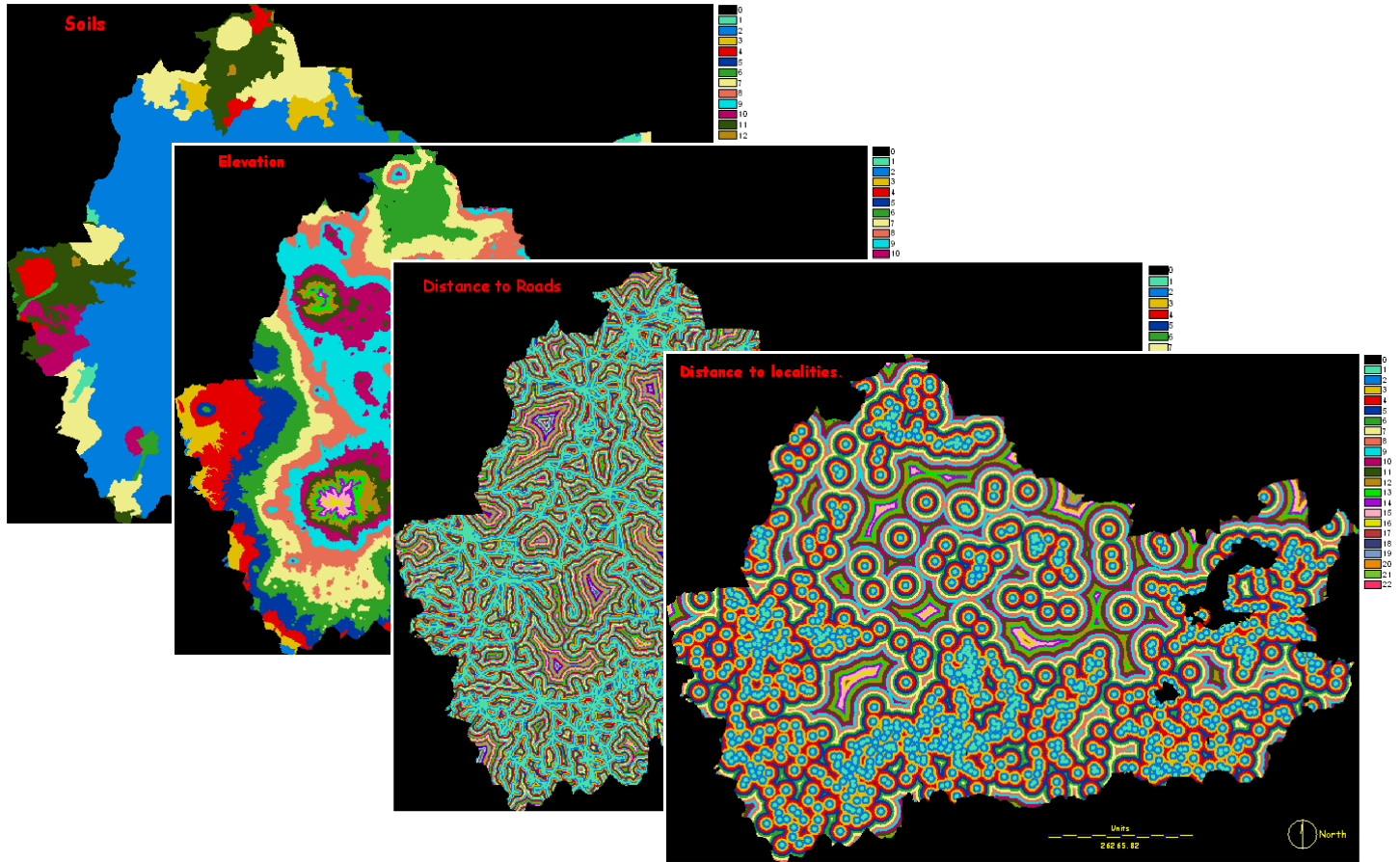
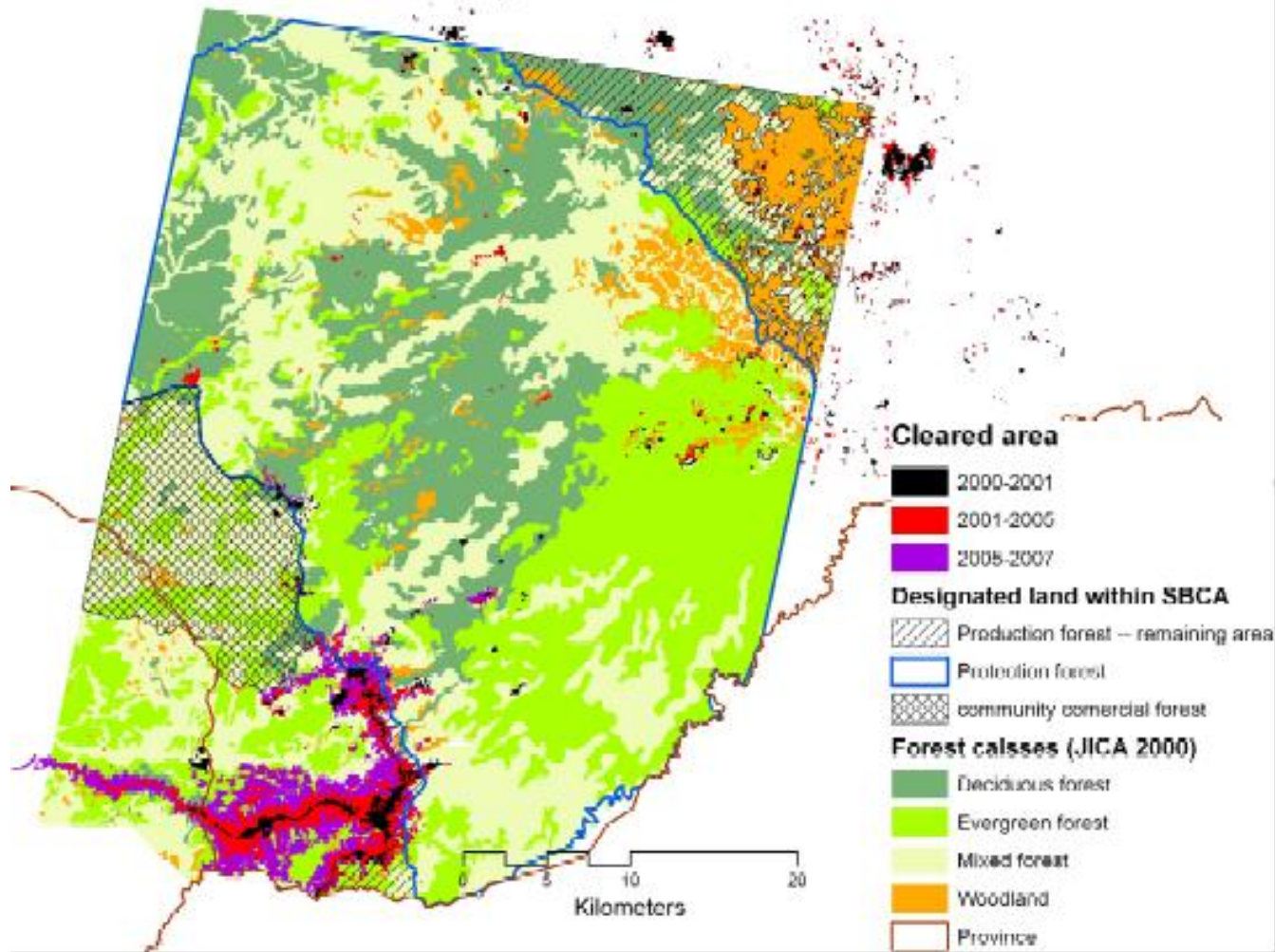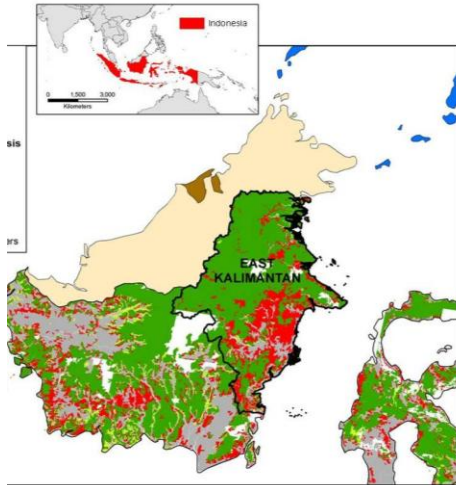# General pattern of deforestation affects importance of different drivers

Frontier pattern

Forest non-forest mosaic
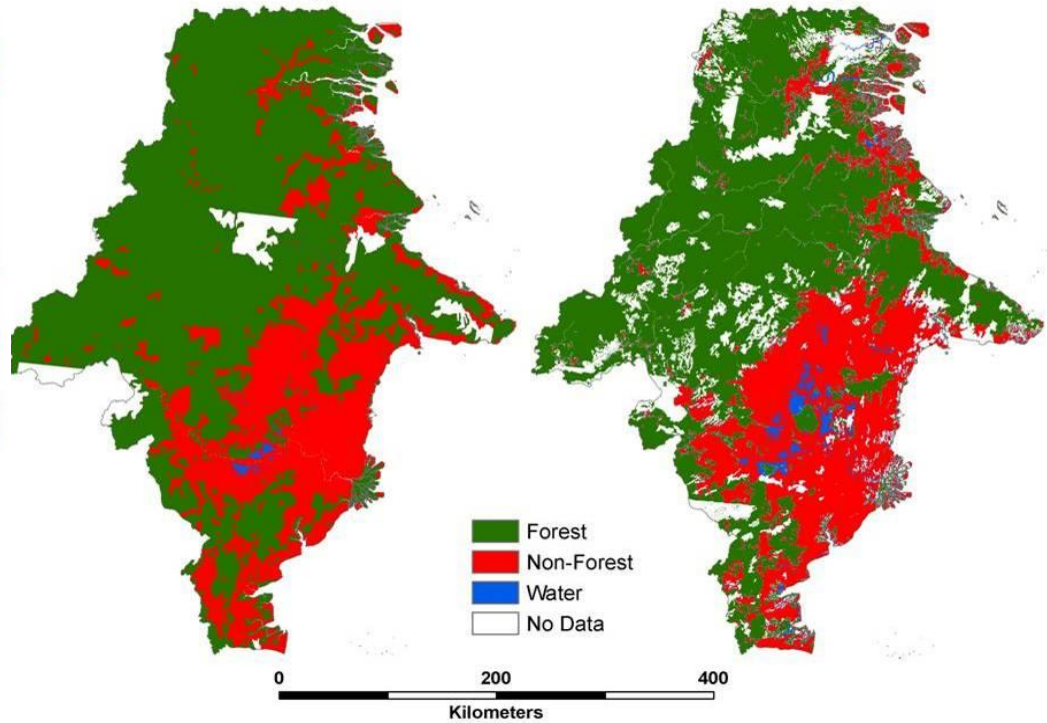
WCS Frontier Example - Cambodia

Cleared area
- 2000-2001
- 2001-2005
- 2005-2007

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Forest caisses (JICA 2000)
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- Province

Kilometers
0   5   10   20

East Kalimantan, Indonesia as a case study

Landcover map 1997

Landcover map 2003

Forest
Non-Forest
Water
No Data

0   200   400
Kilometers

S. Petrova, F. Stolle (WRI), and S. Brown, 2007

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# Main proxy drivers of deforestation in East Kalimantan

Tested 102 combinations of drivers to explain deforestation in the region

Kappa for location statistic	Driver maps combinations used to create suitability maps					
	Accessibility driver maps					Topography
	Cities (HR)	Deforested area (HR)	Sawmills (HR)	Rivers (HR)	Roads (HR)	Elevation (HR)
0.6324	X	X	X	X		X
0.6320	X	X	X			X
0.6282		X	X			X
0.6280		X	X	X		X
0.6265	X	X	X	X	X	X
0.6262		X	X	X	X	X
0.6258	X	X	X		X	X

Accessibility is modeled as distance from ……..

"Threat" map of future deforestation

No Data
Deforested Area in 2003
Deforestation Threat
High
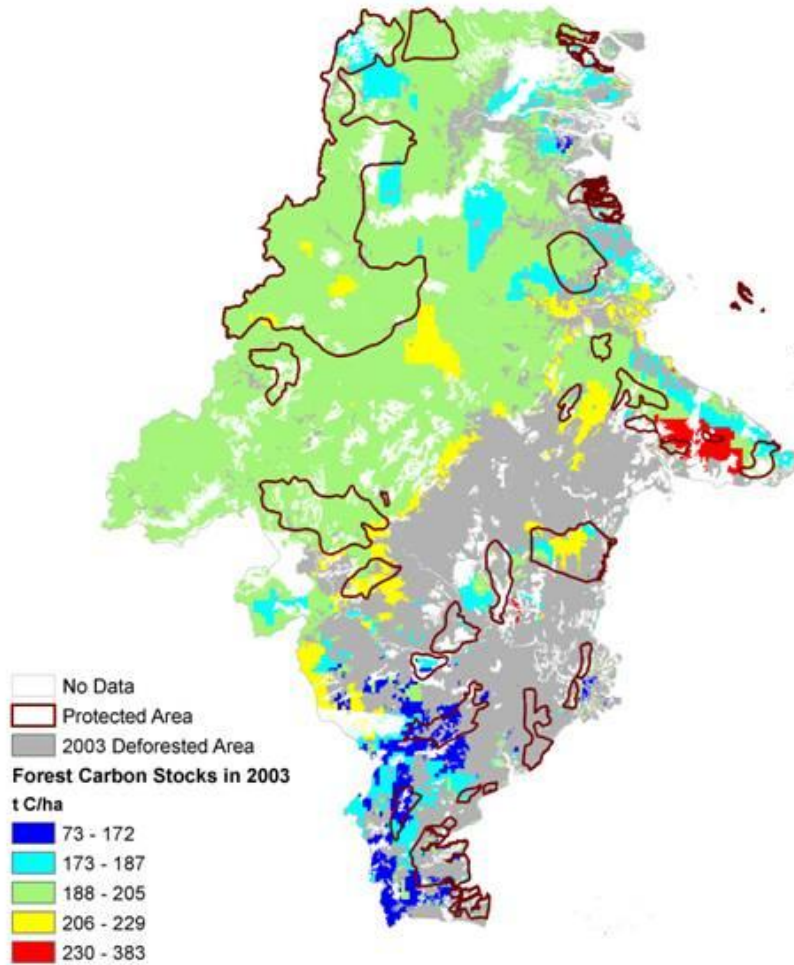Moderate
Low
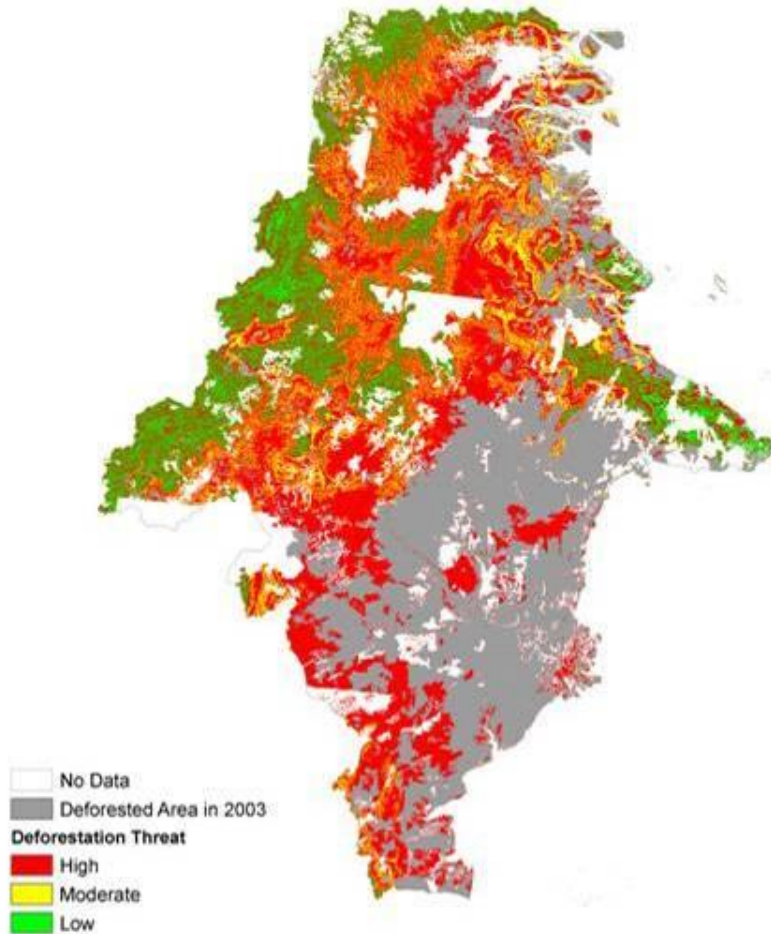
- Combines suitability for change map with projected rates of deforestation over 10 year period— generates a potential land use change map for period 2003-2013

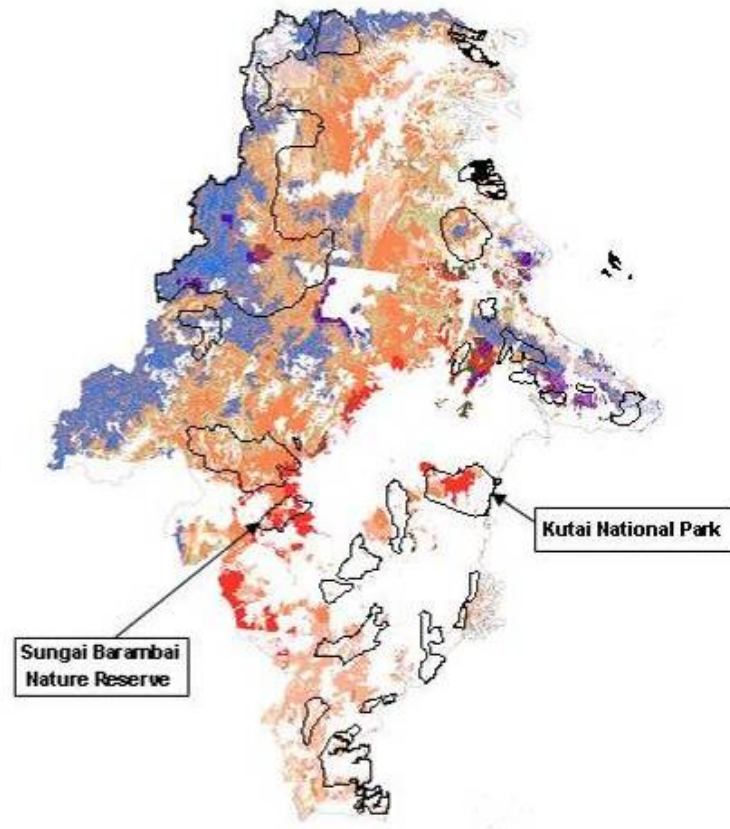- Rescaled based on equal interval of full range (1-210) into three classes

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Combine with map of carbon stocks in above- and below- ground biomass pools

No Data
Protected Area
2003 Deforested Area
Forest Carbon Stocks in 2003
t C/ha
73 - 172
173 - 187
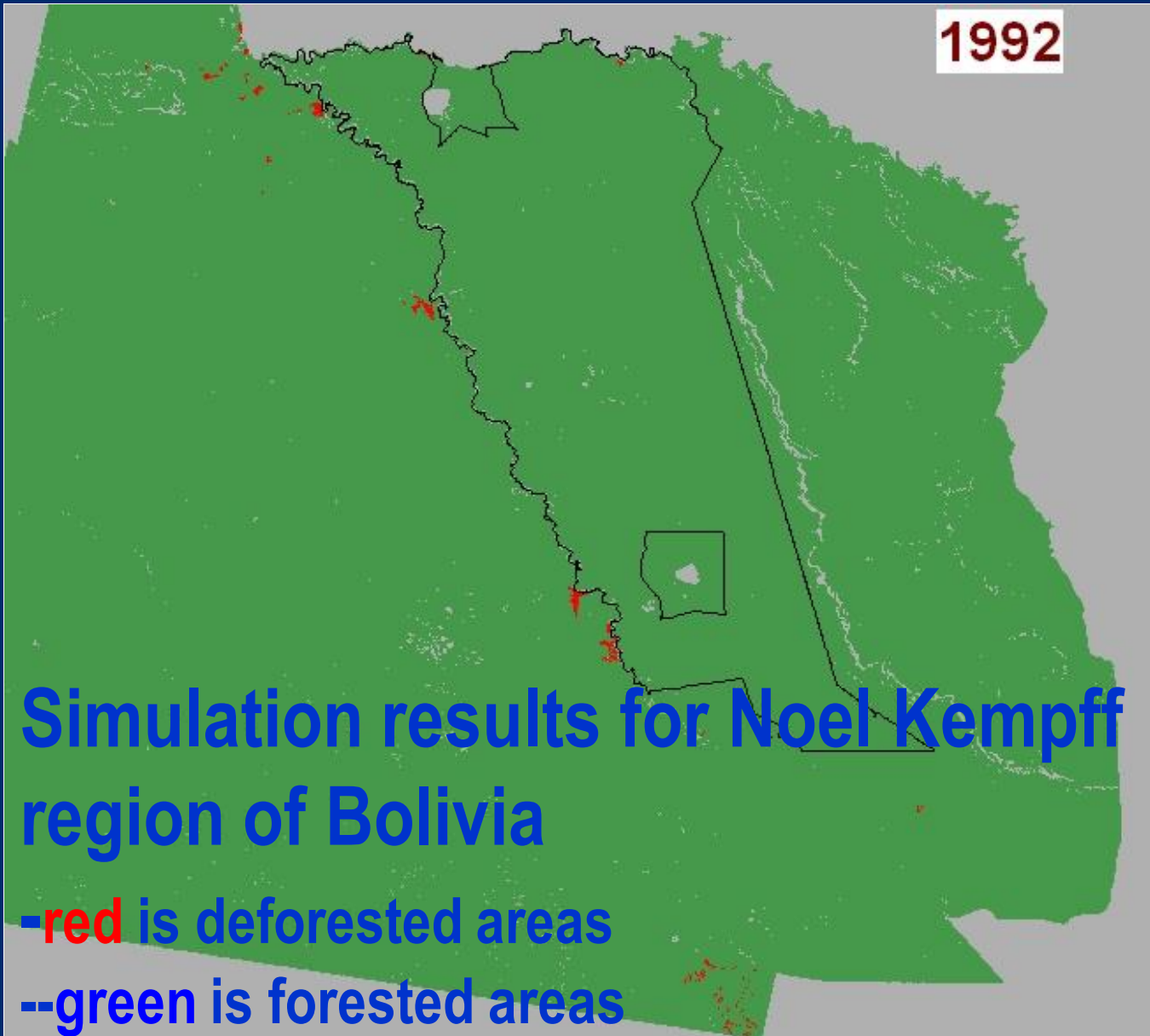188 - 205
206 - 229
230 - 383

Brown, S., L. R. Iverson, A. Prasad, A. L. Brenkert, T. W. Beaty, and R. M. Cushman. 2000. Geographical Distribution of Biomass Carbon in Tropical Southeast Asian Forests: A Database. ORNL/CDIAC-119, NDP-068.
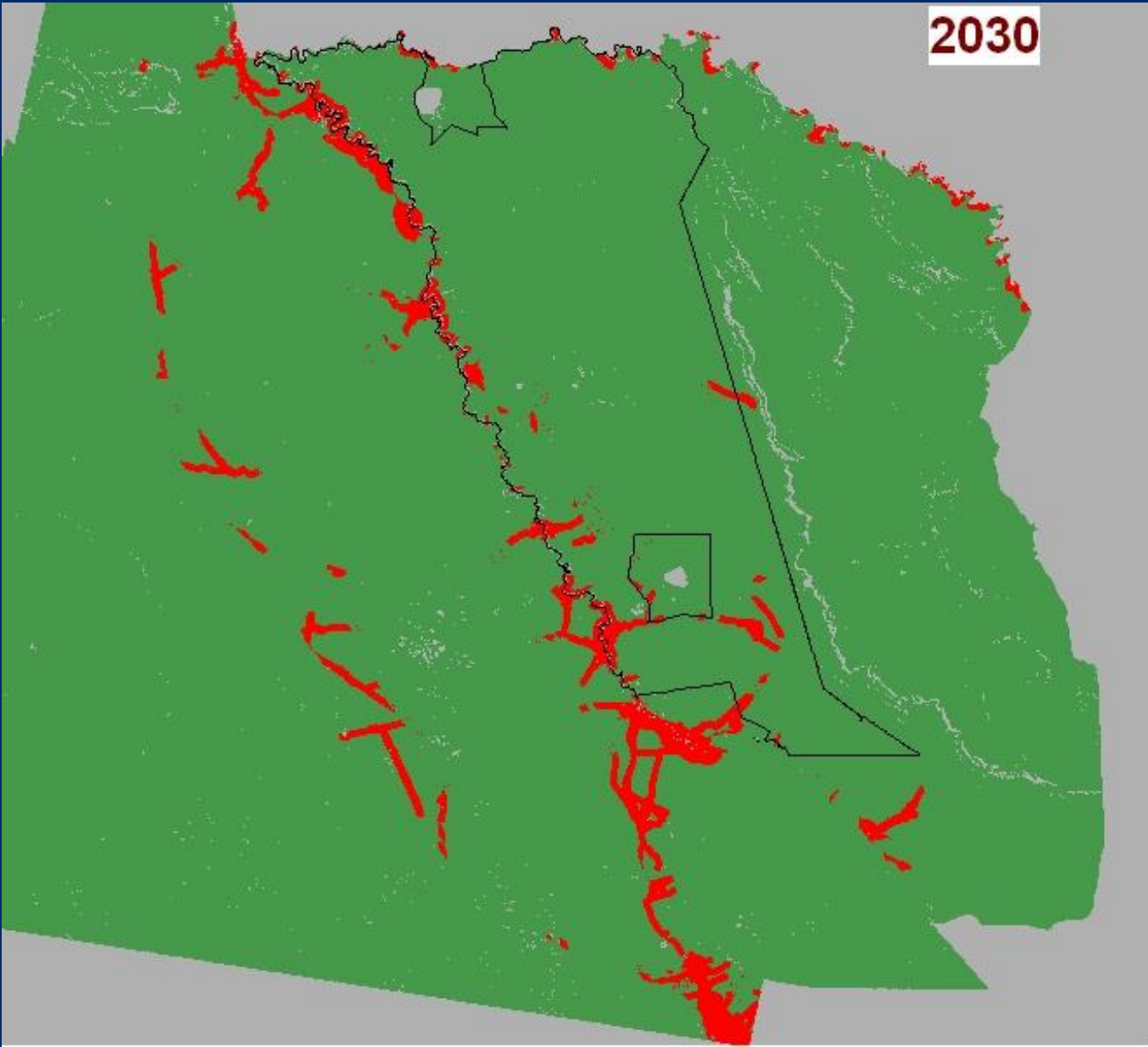
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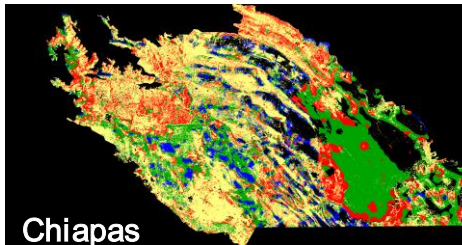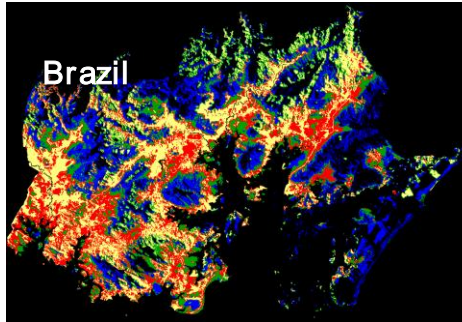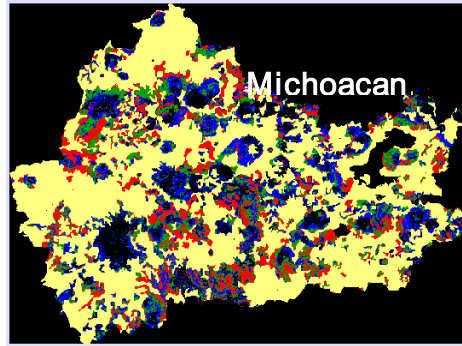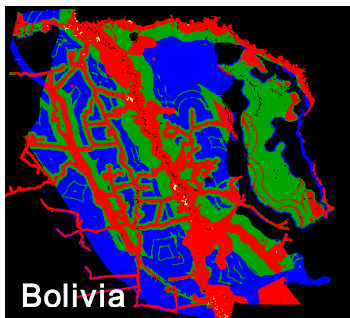**Identifies areas with potential high "pay-off" if well protected**

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No Data
Protected Area
Deforestation threat class /Carbon category
Low threat /Medium carbon
Low threat /Medium High carbon
Low threat /High carbon
Low threat /Very High carbon
Moderate threat /Medium carbon
Moderate threat /Medium High carbon
Moderate threat /Very High carbon
Moderate threat /High carbon
High threat /Medium carbon
High threat /Medium High carbon
High threat /High carbon
High threat /Very High carbon

Kutai National Park

Sungai Barambai
Nature Reserve

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1992

Simulation results for Noel Kempff region of Bolivia

-**red** is deforested areas

--**green** is forested areas

Maps of potential land use change

Belize

Campeche

Bolivia

Michoacan

Brazil

Chiapas

■ Outside Analysis or No Potentiality
■ Low Deforestation Potentiality
■ Med Deforestation Potentiality
■ High Deforestation Potentiality
■ Already Developed

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