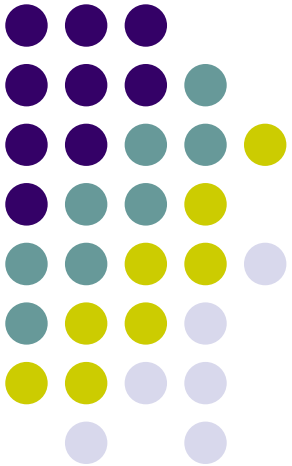
GLOBAL OVERVIEW OF TROPICAL FORESTS IN ADDRESSING CLIMATE CHANGE

Rodel D. Lasco

World Agroforestry Centre (ICRAF)



Outline

- The tropical forests of the world
- Tropical forests and the carbon cycle
- Tropical forests and climate change mitigation
- Tropical forest and climate change adaptation

I. Tropical Forests of the World

Figure 1. Tropical forest distribution derived from the Global Land-Cover 2000 map with insets from South America, Central Africa and Southeast Asia. One can see that in South America and Southeast Asia, protected areas (in yellow) are threatened by deforestation. Mayaux et al, 2005

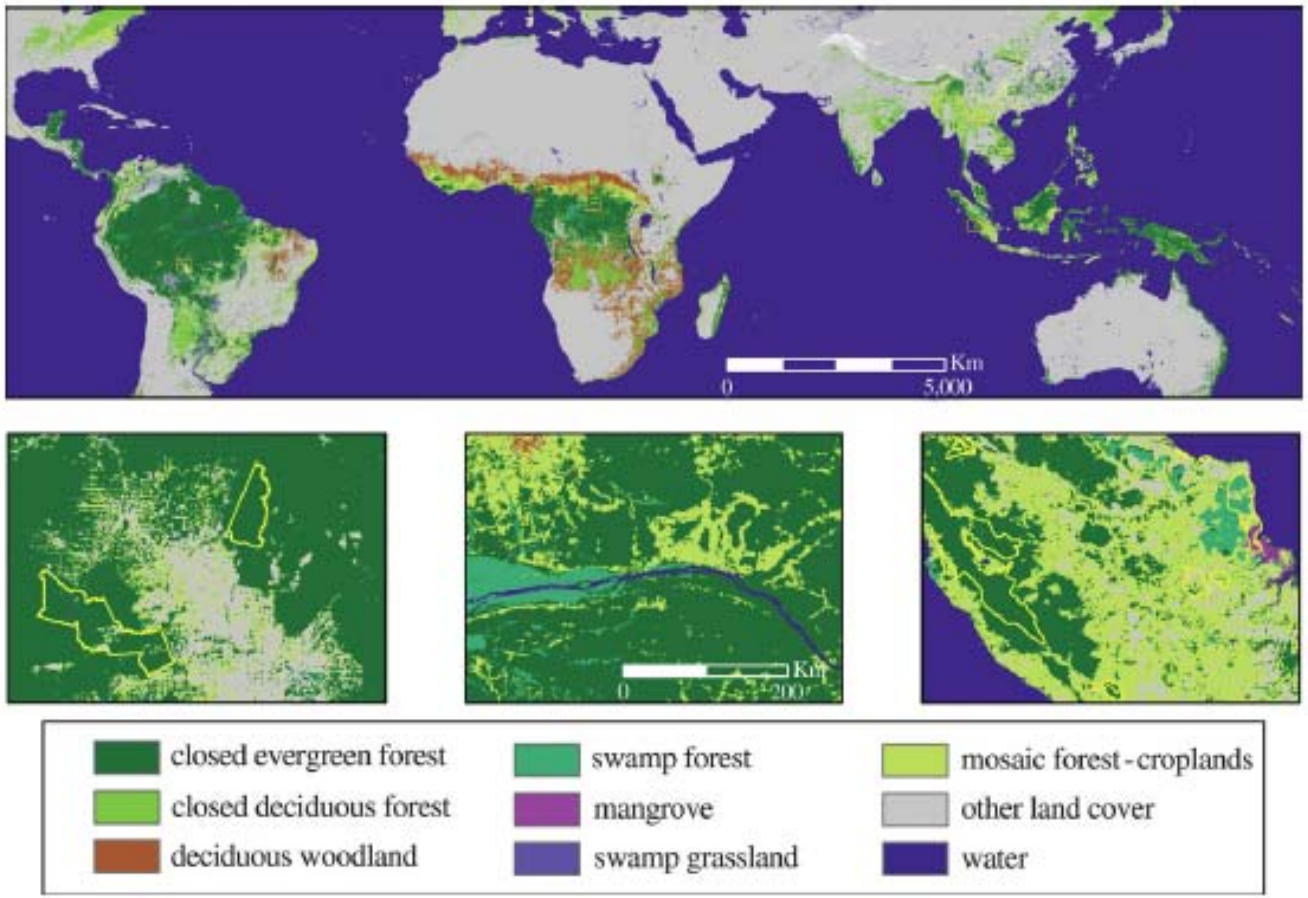


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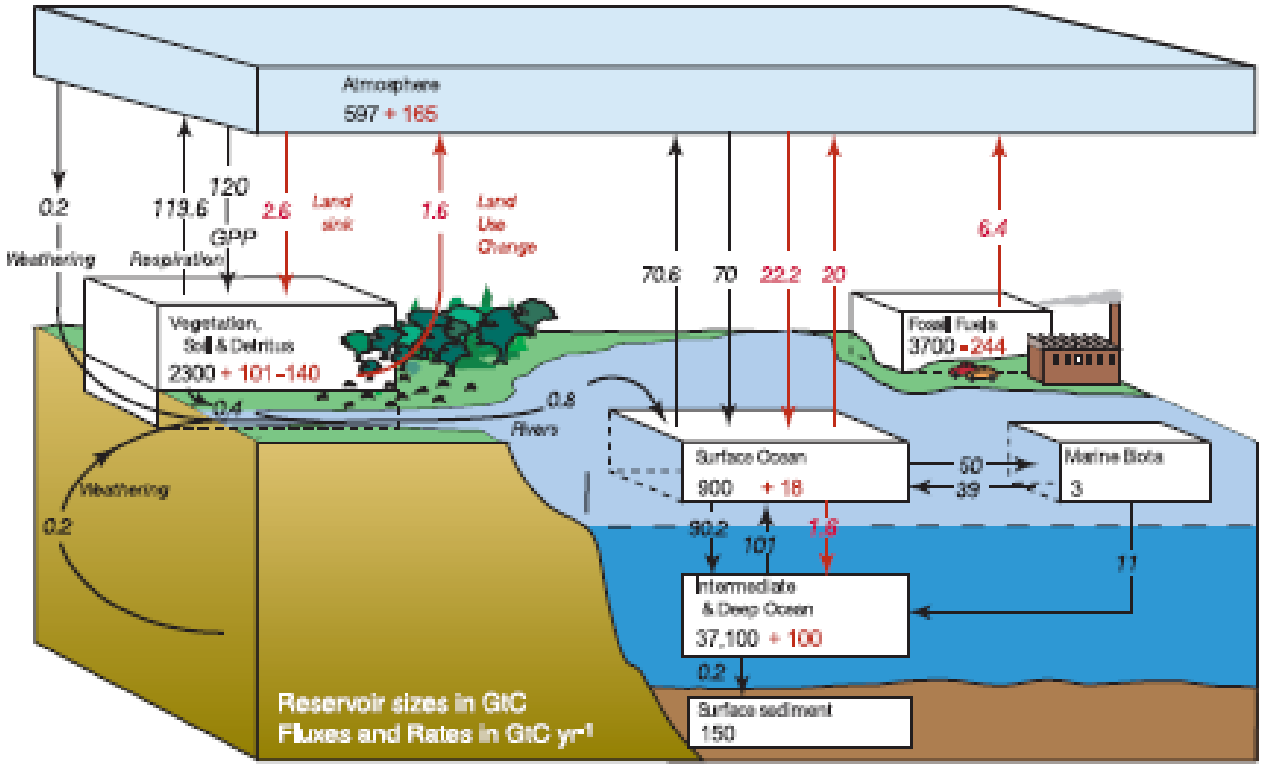
Table 2 Natural Forest area (10^6 ha) 1980–2005 in 90 tropical countries from data in Forest Resources Assessments (FRAs) 1980, 1980 (1982 revision), 1990, 2000, and 2005 (from Grainger, 2008)

Location	FRA 1980	"FRA 1982"	FRA 1990		FRA 2000		FRA 2005		
	1980	1980	1980	1990	1990	2000	1990	2000	2005
Africa	703	703	569	528	684	629	672	628	607
Asia-Pacific	337	337	350	311	307	265	342	312	296
Latin America	931	896	992	918	936	905	934	889	865
Totals	1,970	1,935	1,910	1,756	1,926	1,799	1,949	1,829	1,768
No. of countries	76	76	90	90	90	90	90	90	90

Table 3. Humid tropical forest cover estimates for the years 1990 and 1997 and mean annual change estimates during the 1990–1997 period. All figures are 10^6 ha. (from Archard et al., 2002)

	Latin America	**Africa**	**Southeast Asia**	**Global**
Total study area	1155	337	446	1937
Forest cover in 1990	669 ± 57	198 ± 13	283 ± 31	1150 ± 54
Forest cover in 1997	653 ± 56	193 ± 13	270 ± 30	1116 ± 53
Annual deforested area	2.5 ± 1.4	0.85 ± 0.30	2.5 ± 0.8	**5.8 ± 1.4**
Rate	0.38%	0.43%	0.91%	0.52%
Annual regrowth area	0.28 ± 0.22	0.14 ± 0.11	0.53 ± 0.25	1.0 ± 0.32
Rate	0.04%	0.07%	0.19%	0.08%
Annual net cover change	-2.2 ± 1.2	-0.71 ± 0.31	-2.0 ± 0.8	- 4.9 ± 1.3
Rate	0.33%	0.36%	0.71%	0.43%
Annual degraded area	0.83 ± 0.67	0.39 ± 0.19	1.1 ± 0.44	2.3 ± 0.71
Rate	0.13%	0.21%	0.42%	0.20%

II. Tropical Forests and the Carbon Cycle



IPCC, 2007

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II. Tropical Forests and the Carbon Cycle

- The best estimate of the IPCC is that LULUCF activities, mainly tropical deforestation, contributed 1.6 Gt C/yr of anthropogenic emissions in the 1990s
- FAO forest resources assessment showed that globally, carbon stocks in forest biomass decreased by 1.1 Gt of carbon annually between 1999 and 2005
- There is still much uncertainty on the size of the contribution of land use processes to greenhouse gas emissions in general

Table 6. Land to atmosphere emissions resulting from land use changes during the 1990s (GtC yr–1). Positive values indicate carbon losses from land ecosystems. Numbers in parentheses are ranges of uncertainty (IPCC., 2007).

	Tropical Americas	Tropical Africa	Tropical Asia	Pan-Tropical	Non-tropics	Total Globe
1990s						
Houghton (2003)[a]	0.8 ± 0.3	0.4 ± 0.2	1.1 ± 0.5	2.2 ± 0.6	-0.02 ± 0.5	2.2 ± 0.8
Defries et.al. (2002)[b]	0.5 (0.2 to 0.7)	0.1 (0.1 to 0.2)	0.4 (0.2 to 0.6)	1.0 (0.5 to 1.6)	n.a.	n.a.
Achard et.al. (2004)[c]	0.3 (0.3 to 0.4)	0.2 (0.1 to 0.2)	0.4 (0.3 to 0.5)	0.9 (0.5 to 1.4)	n.a.	n.a.
AR4[d]	0.7 (0.4 to 0.9)	0.3 (0.2 to 0.4)	0.8 (0.4 to 1.1)	1.6 (1.0 to 2.2)	-0.02 (-0.5 to +0.5)	1.6 (0.5 to 2.7)

III. Tropical Forests and Climate Change Mitigation

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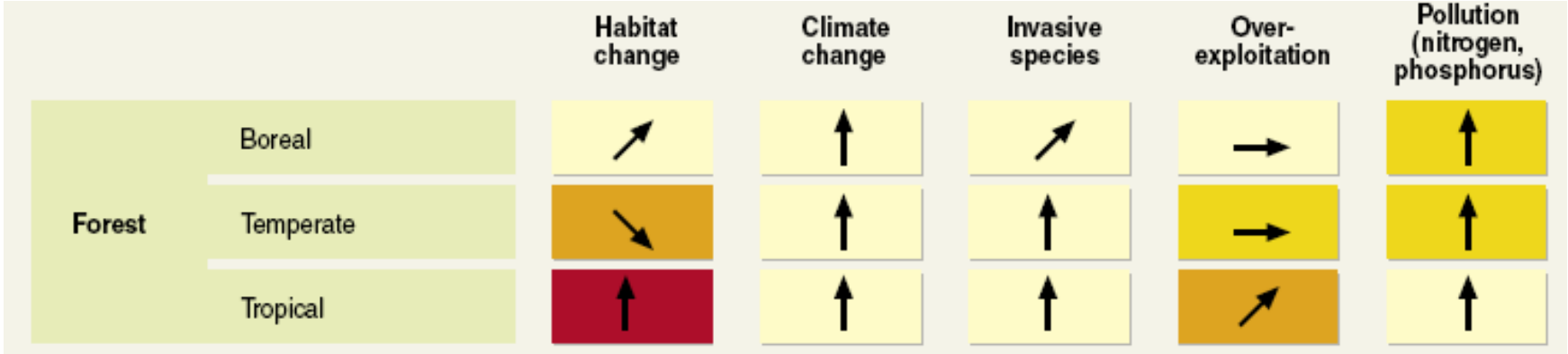
Findings of the 2007 IPCC Report

- The tropical region has the largest potential for climate change mitigation through forestry activities.
- It is difficult to quantify the total potential of the world's tropical forest to mitigate climate change.
- More detailed estimates of economic or market potential for mitigation options by region or country are needed to enable policy makers to make realistic estimates of mitigation potential
- Initial studies indicate that the largest potential is in avoiding deforestation and enhancing afforestation and reforestation, including bio-energy.

Main tropical deforestation fronts in the 1980s and 1990s from Lambin et al. (2003) and Lepers et al. (in press). [Source: Mayaux et al 2005]

Main Direct Drivers of Change in Biodiversity and Ecosystems

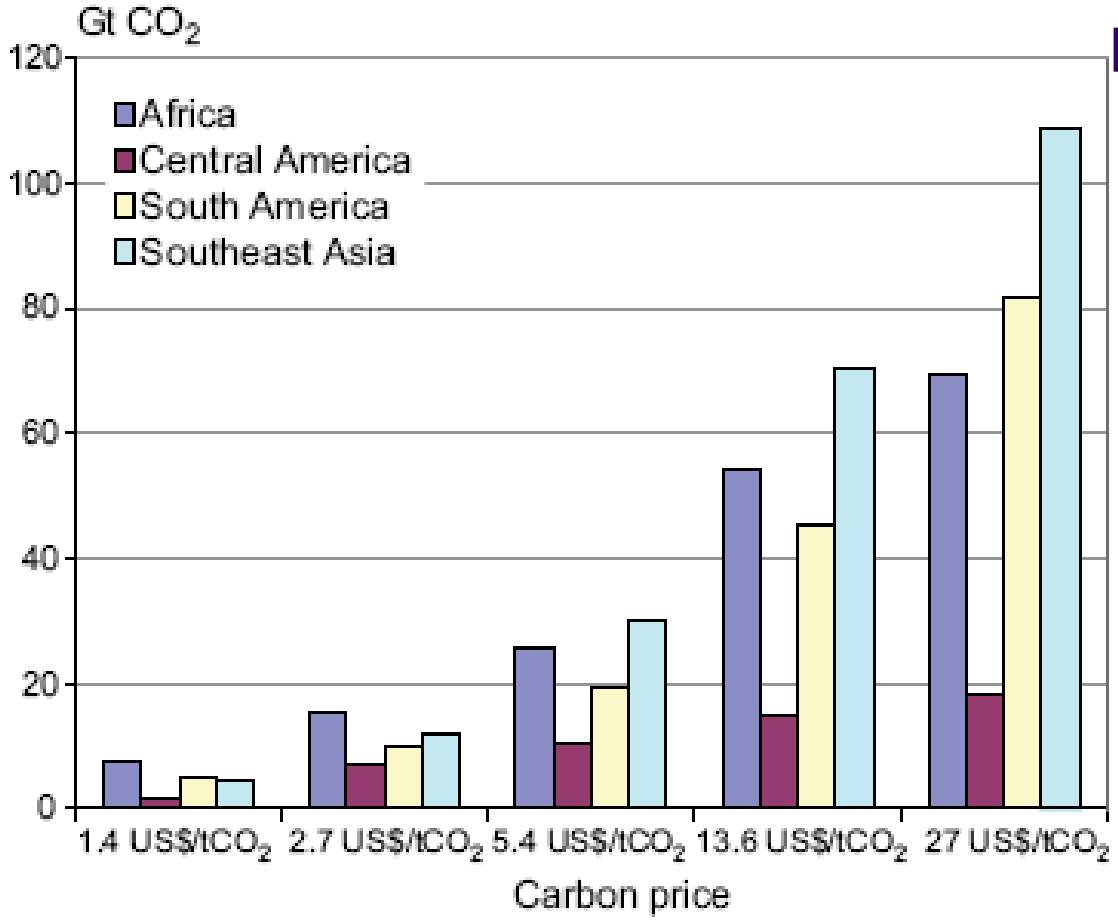


MA, 2005

Findings of the 2007 IPCC Report

- In the short-term (2008-2012)→ 93% of the total mitigation potential in the tropics will be avoided deforestation
- In the long-term→ for US$27.2 /tCO2, deforestation could potentially be virtually eliminated.
- Over 50 years, this could mean a net cumulative gain of 278,000 MtCO2 relative to the baseline and 422 million additional hectares in forests

Figure 4 Cumulative carbon gained through avoided deforestation by 2055 over the reference case, by tropical regions under various carbon price scenarios (from Nabuurs et al., 2007).



Largest gain In SE Asia

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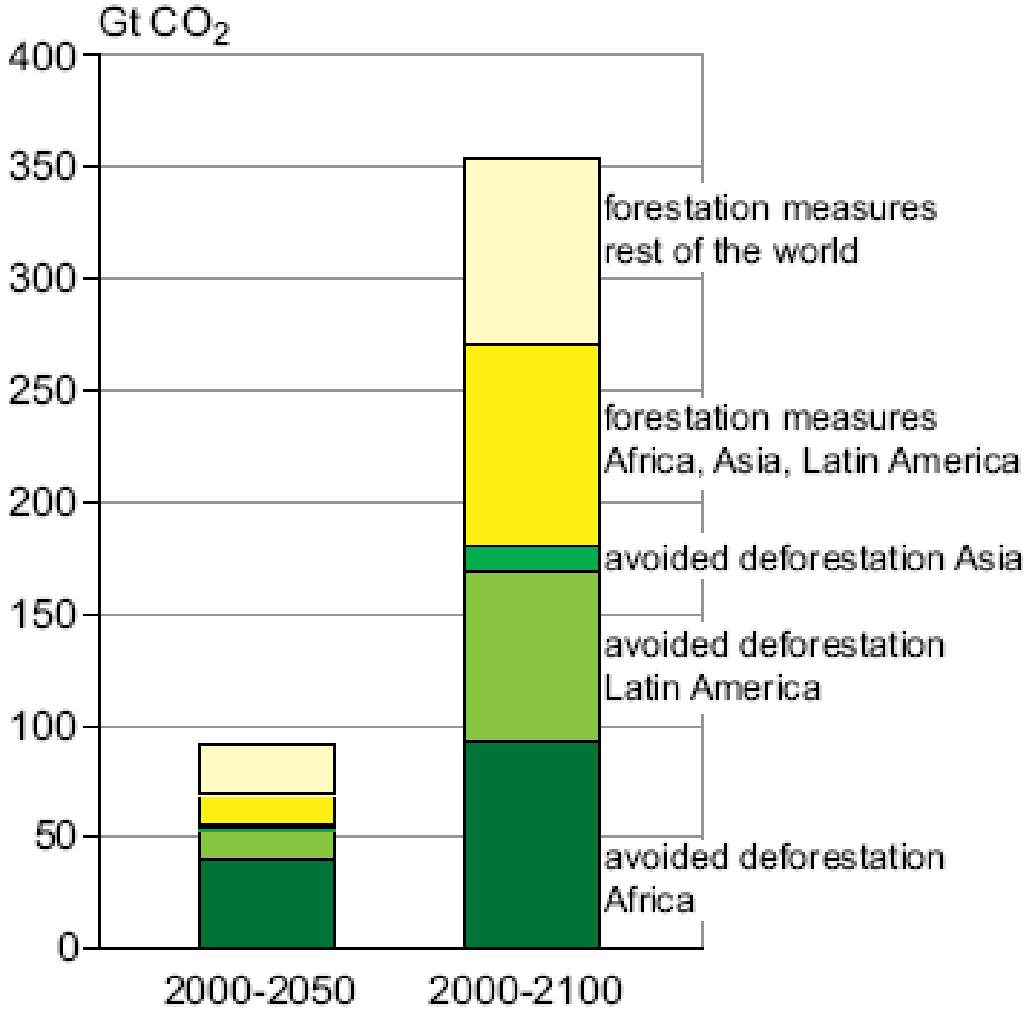
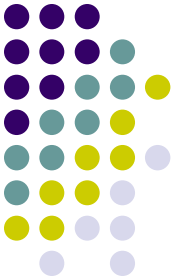
Findings of the 2007 IPCC Report

- Next to avoided deforestation, establishment of new forests through reforestation and afforestation offer the second largest potential to mitigate climate
- The cost range→ 0.5 US$ to 7 US$/tCO2 for forestry projects in developing countries, compared to 1.4 US$ to 22 US$/tCO2 for forestry projects in industrialized countries
- In the short-term (2008-2012), it is estimated that the economic potential area available for afforestation/ reforestation under the CDM is 5.3 M ha in Africa, Asia and Latin America together, with Asia accounting for 4.4 M ha

Figure 5 Cumulative mitigation potential (2000-2050 and 2000-2100) according to mitigation options under the 2.7 US$/tCO2 +5%/yr annual carbon price increment from Nabuurs et al., 2007)



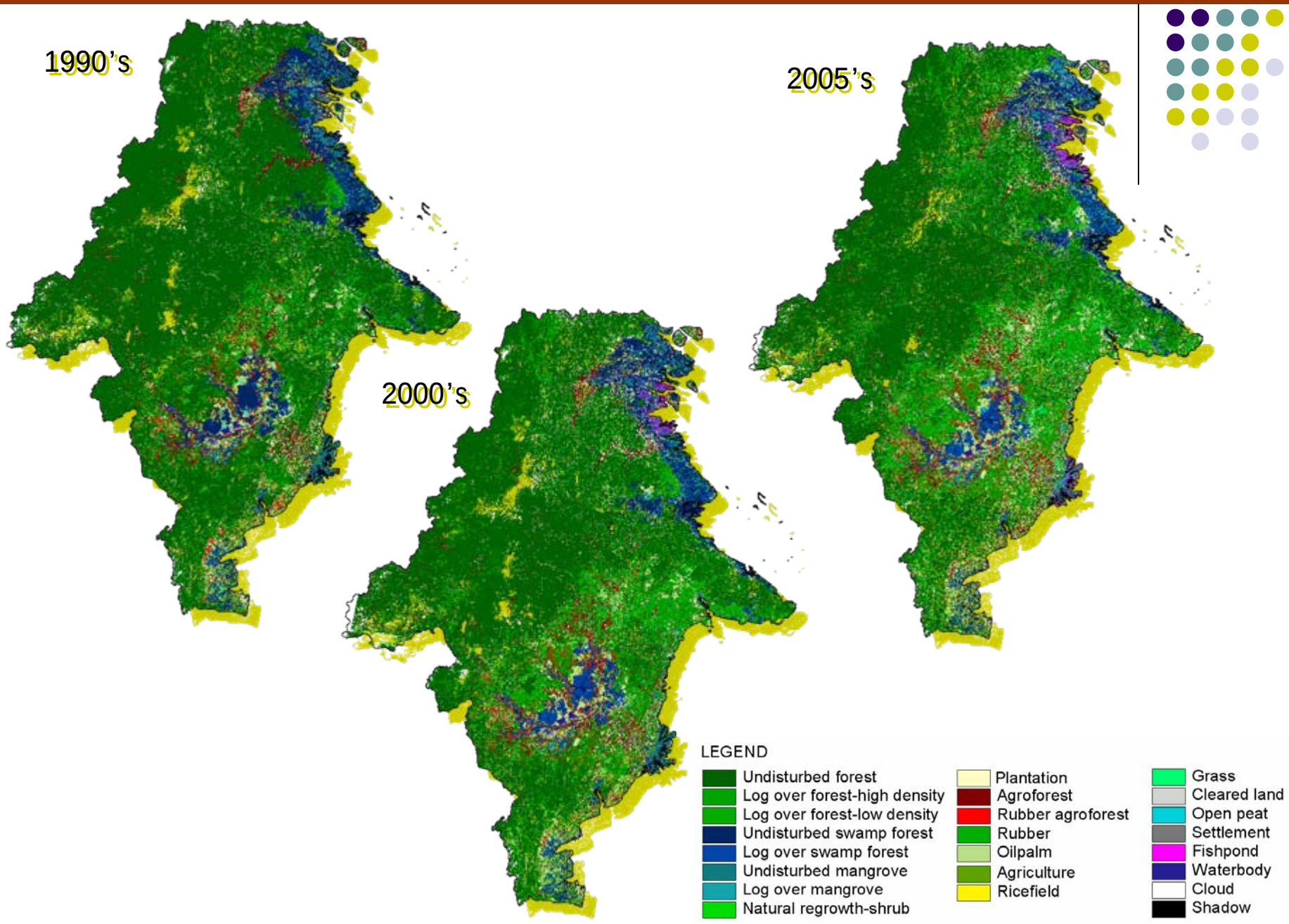
REDD: Results from the ASB Partnership for the Tropical Forest Margins (from Swallow et al., 2007)



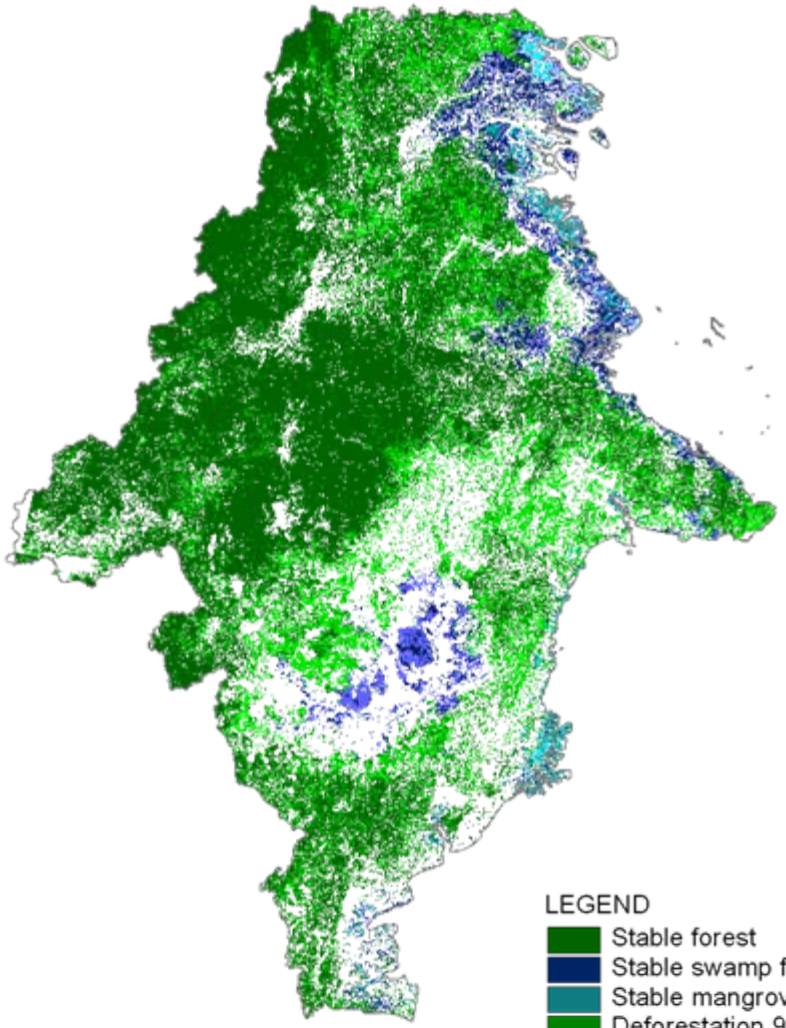
Opportunity cost analysis of avoided land use to reduce CO2 emissions:

- clarification and description of major land uses
- calculation of time-averaged carbon stocks for the major land uses;
- calculation of the private and social profitability of the land uses in terms of discounted net present value;
- land use characterization and land use change analysis; and
- processing this information into a two-dimensional graph charting the opportunity costs of avoiding deforesting land use changes against volume of CO2-e emissions.

Results : East Kalimantan Land Cover Maps



Results : East Kalimantan Forest Cover Changes



-**Deforestation** is defined as changes from forest classes (undisturbed/log-over) to non forest/non vegetation classes

-**Degradation** is changes from undisturbed forest classes to log over forest classes

Classes	Parameter	Deforestation		Degradation	
		1990-2000	2000-2005	1990-2000	2000-2005
Forest	Total (km2) of	4371.0	1674.6	16727.3	10950.3
	Rate of	**3.0%**	**1.2%**	**13.9%**	**11.2%**
	Annual rate of	**0.6%**	**0.6%**	**2.3%**	**2.7%**
Swamp forest	Total (km2) of	884.4	430.3	3171.6	1858.0
	Rate of	**5.8%**	**3.1%**	**25.6%**	**22.4%**
	Annual rate of	**1.0%**	**2.3%**	**4.4%**	**9.3%**
Mangrove	Total (km2) of	33031.0%	35527.0%	17076.0%	81177.0%
	Rate of	**10.2%**	**12.2%**	**5.3%**	**29.8%**
	Annual rate of	**1.2%**	**4.7%**	**1.9%**	**14.6%**

Figure 6 Abatement cost curve with 3% and 10% discount rate, Ucayali, Peru 1990-1998 (from Swallow et al., 2007)

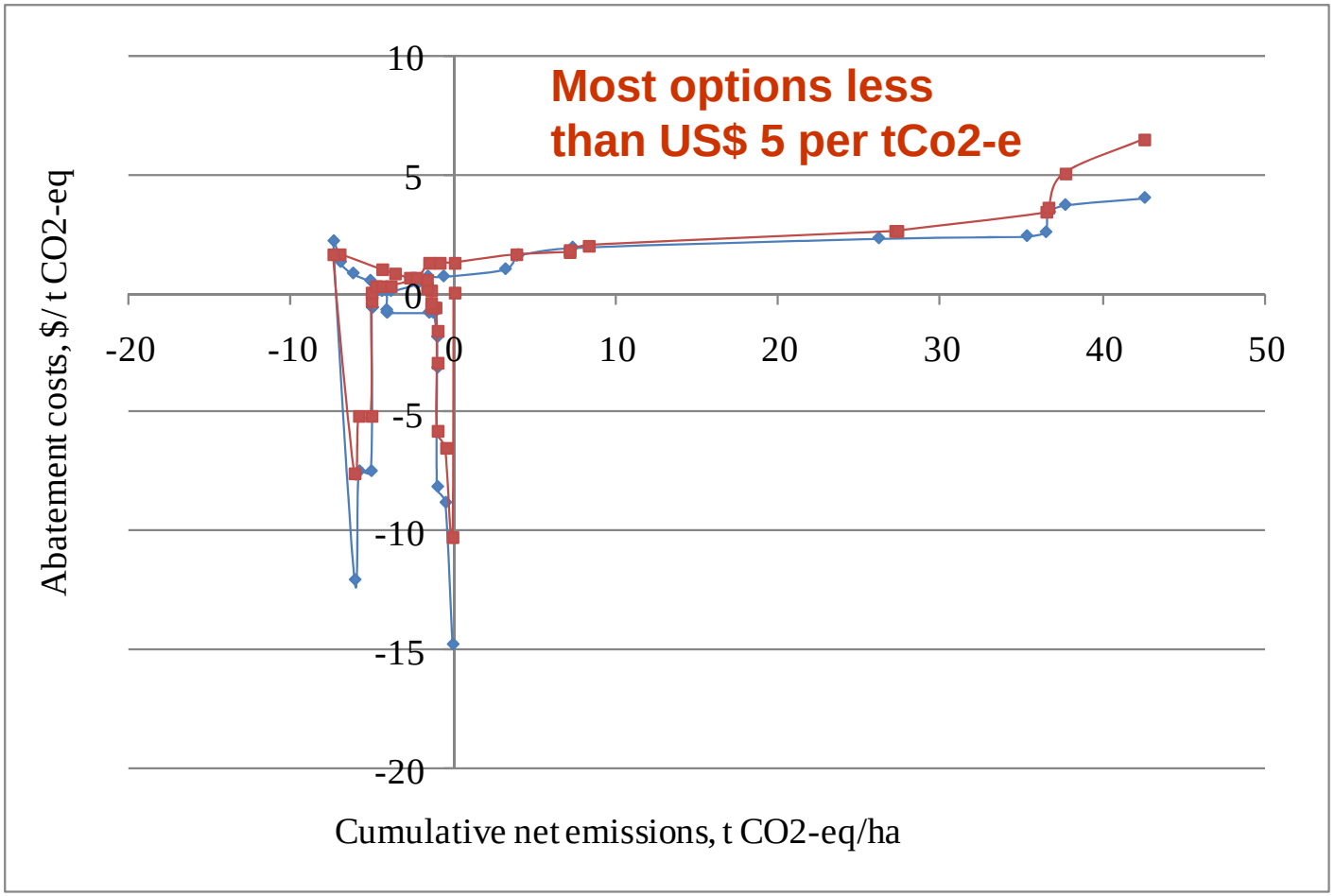


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Table 8 Potential abatement for carbon emissions from AFOLU in 3 provinces per unit area with baseline period of 1990 to 2000

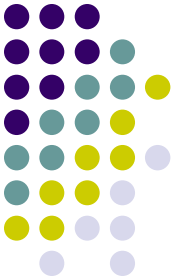
Private NPV	East Kalimantan		Jambi		Jambi (peat inc.)		Lampung	
	t CO2-eq/ha/y	% emission	t CO2-eq/ha/y	% emission	t CO2-eq/ha/y	% emission	t CO2-eq/ha/y	% emission
< 0	0.003	0%	0.128	1%	0.128	0%	0.044	1%
0 - 1 $	1.219	18%	0.54	5%	147.682	94%	0.771	23%
1 - 5 $	4.554	67%	6.288	59%	6.276	4%	1.552	47%
5 - 15 $	0.94	14%	3.145	29%	1.821	1%	0.798	24%
> 15	0.062	1%	0.571	5%	0.557	0%	0.146	4%
Total	6.778	100%	10.671	100%	156.464	100%	3.312	100%

Note: this table from an earlier draft of Swallow et al., 2007

ASB report: key messages

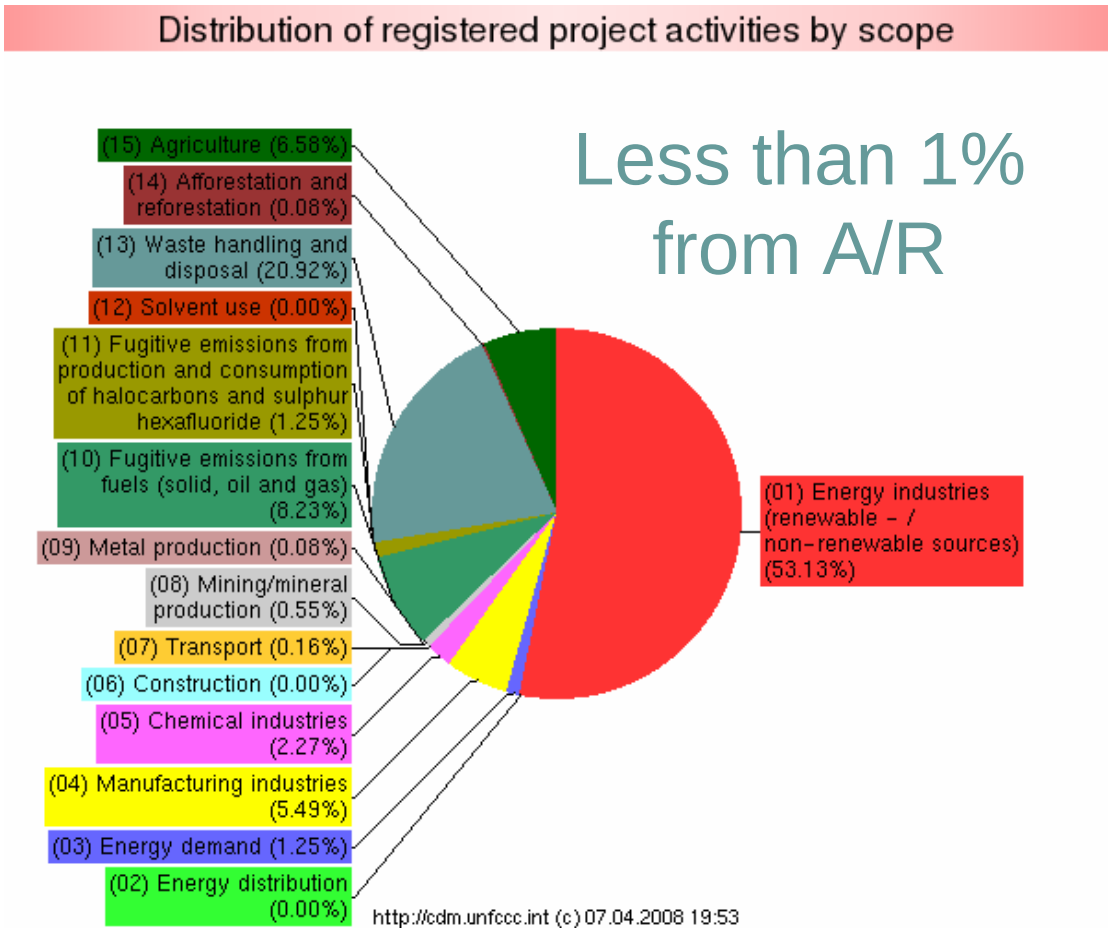
- There are cost-effective opportunities for large reductions in CO2 emissions from avoided deforestation in the humid tropics, provided that appropriate institutions and incentive systems are created
- To be effective in the long-term, REDD mechanisms must provide land users with financial incentives that outweigh the returns from conversion to other land uses.

Tropical forests and the carbon market



- There are still very few takers of forestry carbon projects under the so-called Kyoto market.
- It has been estimate that up to 13.6 million carbon credits may be available by 2012 based on projects on the pipeline

A/R Projects as of 8 April 2008



Less than 1% from A/R

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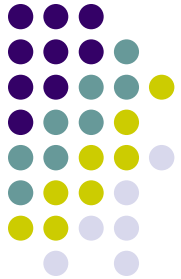
Reasons for slow uptake

- high transaction costs
- lack of base financing
- complicated rules and methodologies

What about the voluntary market?

- slightly more encouraging
- The only source of carbon finance for avoided deforestation
- higher proportion of forestry based credits out of total market transactions than the CDM (36% vs. 1% for CDM)
- forestry projects are the largest component of the voluntary carbon market which in 2006 amounted to 23.7 million t CO2-e valued at US$ 91 million
- voluntary carbon markets have historically served as sources of experimentation and innovation.

IV. Role of Forests in Climate Change Adaptation



- More than 800 million people rely on tropica forests for much of their fuel, food, and income
- Forests and planted trees can help local communities adapt to climate change through livelihood diversification and provision of ecosystems services
- Regulation of water flows in watersheds, promoting soil conservation, provision of goods
- Less emphasized in the context of climate change

Synthesis

- Tropical forests are vital in addressing climate change.
- Tropical deforestation contributes 20% to global greenhouse gas emissions
- Initial indications show that avoided deforestation (REDD) is possible at acceptable costs.
- Tropical forest conservation has a number of co-benefits such as biodiversity conservation and livelihoods for the rural poor.
- Expansion of tropical forests through reforestation and agroforestry could help mitigate climate change
- Tropical forests can help vulnerable groups adapt to climate change

Thank you!

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