



# The Cost of Avoiding Deforestation

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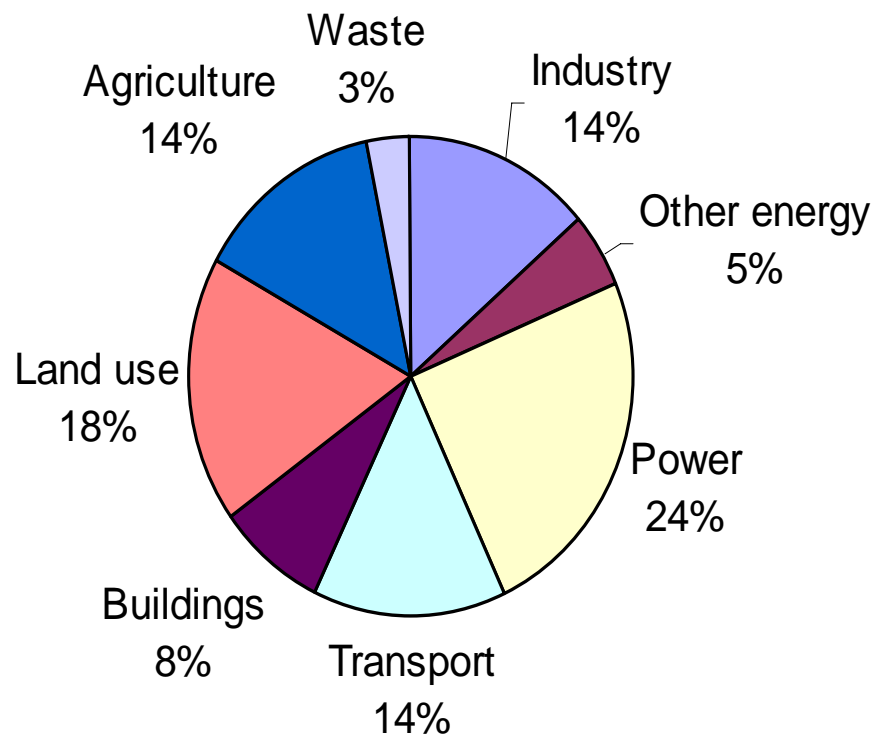
International Regime, Avoided Deforestation and the  
Evolution of Public and Private Forest Policies in the South

Paris

21-23 November 2007



# Greenhouse Gas Emission Sources 2000



Source: Stern Review of the Economics of Climate Change/ WRI CAIT database



# Background to Cost Estimates

- Report commissioned for Stern Review
  - Cost of halving global deforestation rate
- Rough estimate
  - Cost-effectiveness in emission reduction
- Bottom-up basis –specific countries in TOR
  - Brazil, Indonesia, PNG, Cameroon, DRC
- Cost elements
  - Opportunity cost: returns from alternative land use
  - Administration and enforcement costs



# The Target

- Cut the rate of deforestation by half within a decade
- Deforestation defined as complete removal of forest cover (excludes forest degradation)
- FAO estimate: 13 million ha/year (based on net forest loss)
- Target reduction = 6.5 million ha/year



**Deforestation  
(Net Forest  
Loss)  
000 ha/yr**

Cameroon	220
DRC	319
Ghana	115
Bolivia	270
Brazil	3,103
PNG	139
Indonesia	1,871
Malaysia	140
<b>Total</b>	<b>6,177</b>

**46%**



# Focus on Opportunity Cost

- **Why?**
  - Landowners clear forest because they get a higher return from other land uses
- **Implication:**
  - Estimates indicate cost of paying landowners to conserve forests
  - Estimates do not indicate cost of other ways of reducing deforestation: eg increased enforcement



# Key assumptions

- 100% additionality and 0% leakage
  - Governments can target effectively
- Alternative to deforestation is protection
  - No returns from SFM factored in
- Net forest loss equates to deforestation
- Estimates of land use returns can be transferred
  - To other areas and countries



# Factors affecting opportunity costs

- ❑ Soil and climate conditions - land use/yields
- ❑ Scale of operations
- ❑ Inputs and technology
- ❑ Distance from market/transport infrastructure
- ❑ Commodity price cycles
- ❑ Ability to harvest timber before conversion

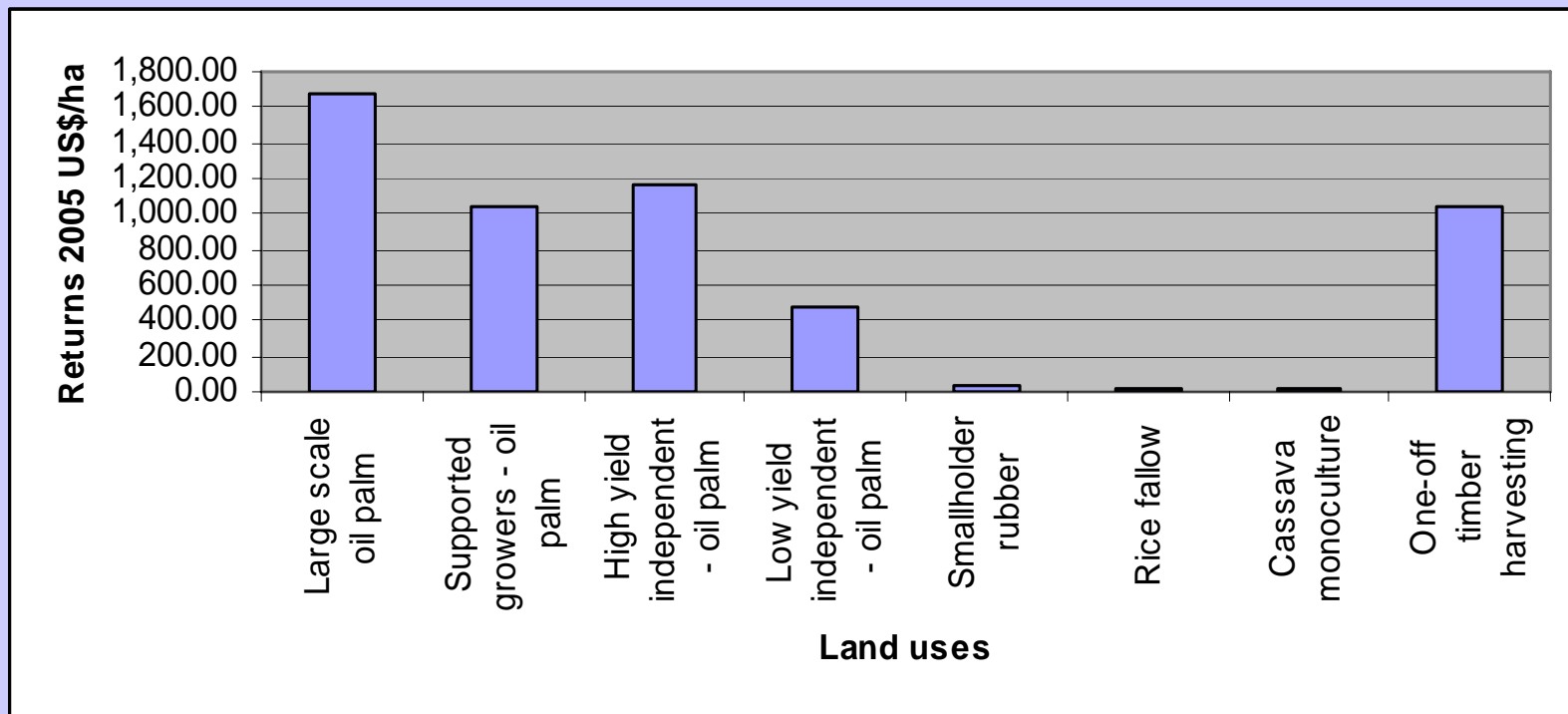


# Approach to estimating opportunity costs

- Returns per hectare
  - Estimates from the literature
    - Different uses, different scales
    - NPV over 30 years at 10% discount rate
- Area to which cost estimates apply
  - Land use patterns in forest margins (Brazil)
  - Assumptions based on:
    - Qualitative statements on importance of various crops/uses
    - Trends in the area planted with different crops

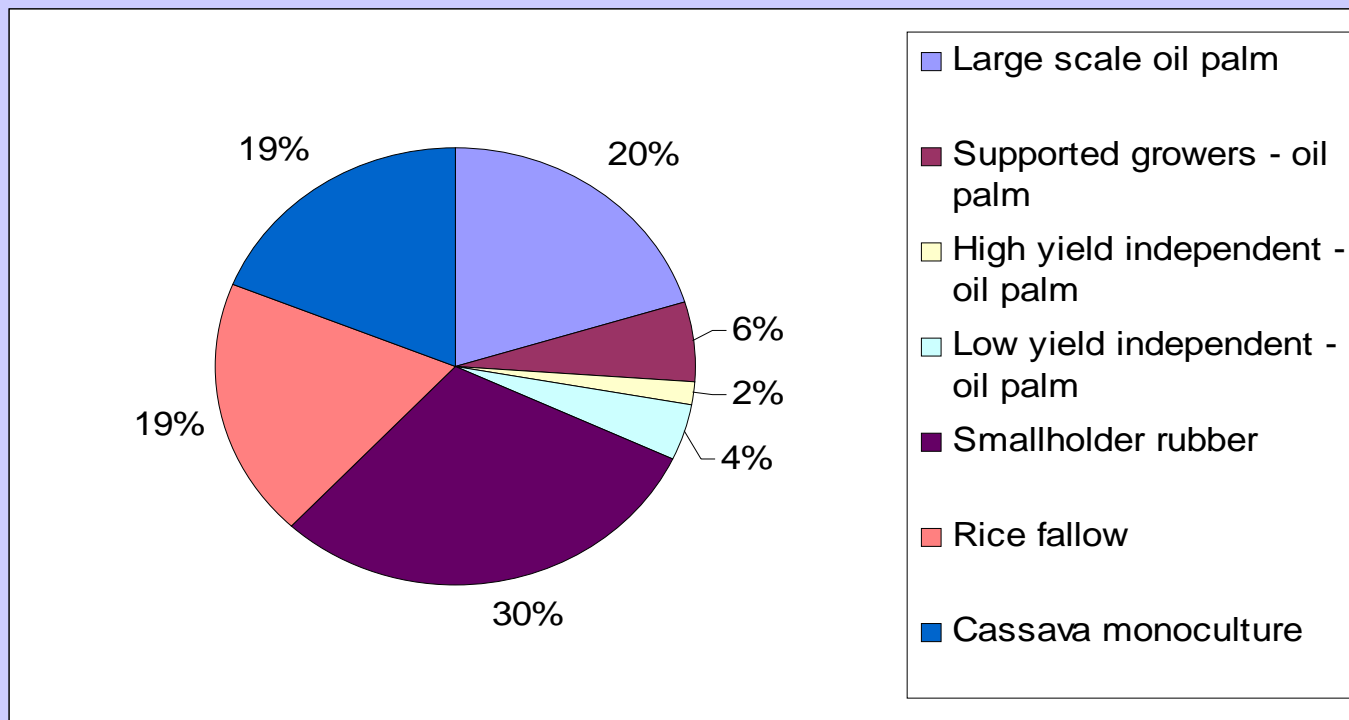


# Land use returns - Indonesia





# Land use in deforestation area Indonesia





# Opportunity Costs

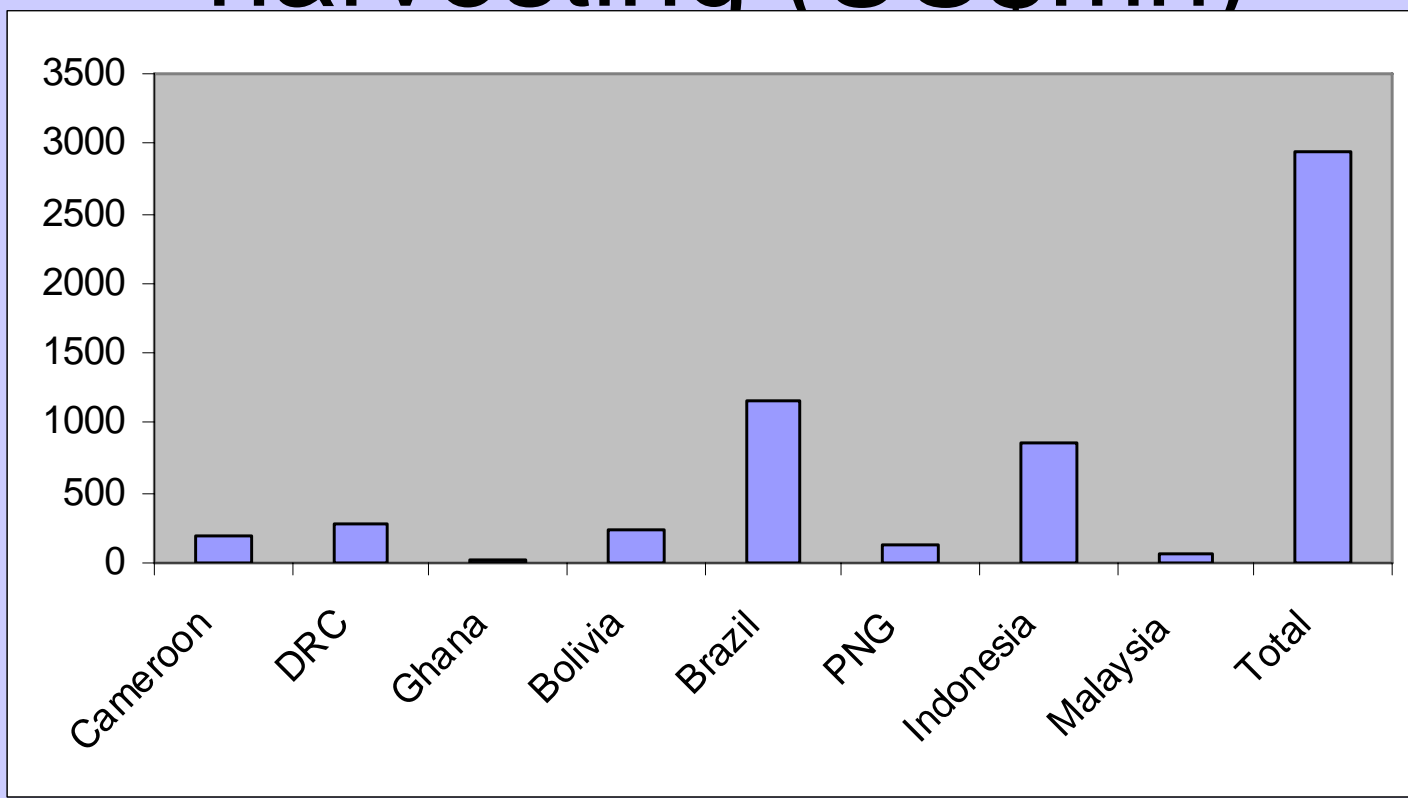
<b>Scenario</b>	<b>Cost (US\$ bn)</b>
Excluding timber harvesting	3.0
Including timber harvesting	6.5
“Medium” timber harvesting	5.0
Highest return land use	11.0
Highest return land use + timber harvesting	15.0



Country	“Medium” scenario % of annual area deforested with commercial logging before conversion
Cameroon	0% - deforestation smallholder-driven
DRC	0% – deforestation smallholder driven
Ghana	100% - Logging concessions common in community forests
Bolivia	30% - excl cattle ranching area
Brazil	70% - excl small scale cattle and food crops
PNG	100% - Logging concessions common in community-owned forests
Indonesia	66% - excl smallholder rice and manioc
Malaysia	80% excl rice fallow



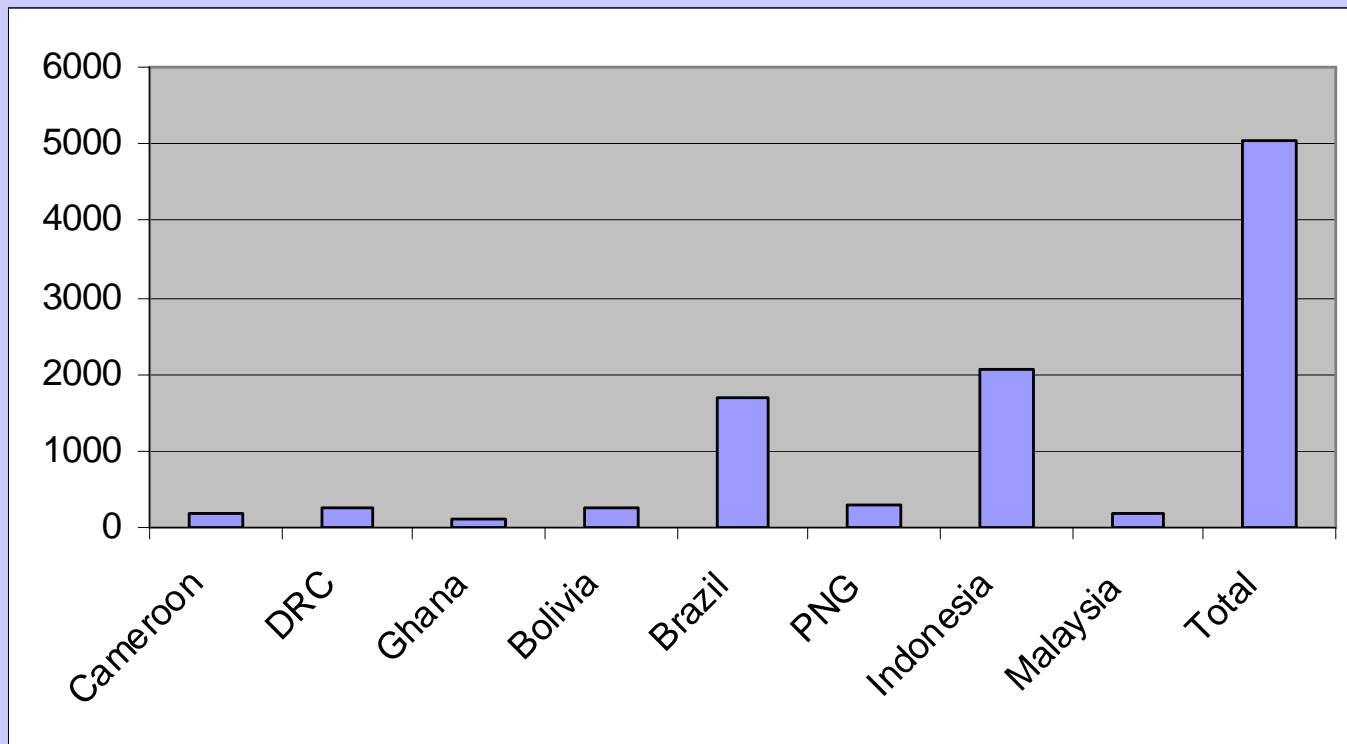
# Costs excluding timber harvesting (US\$m)





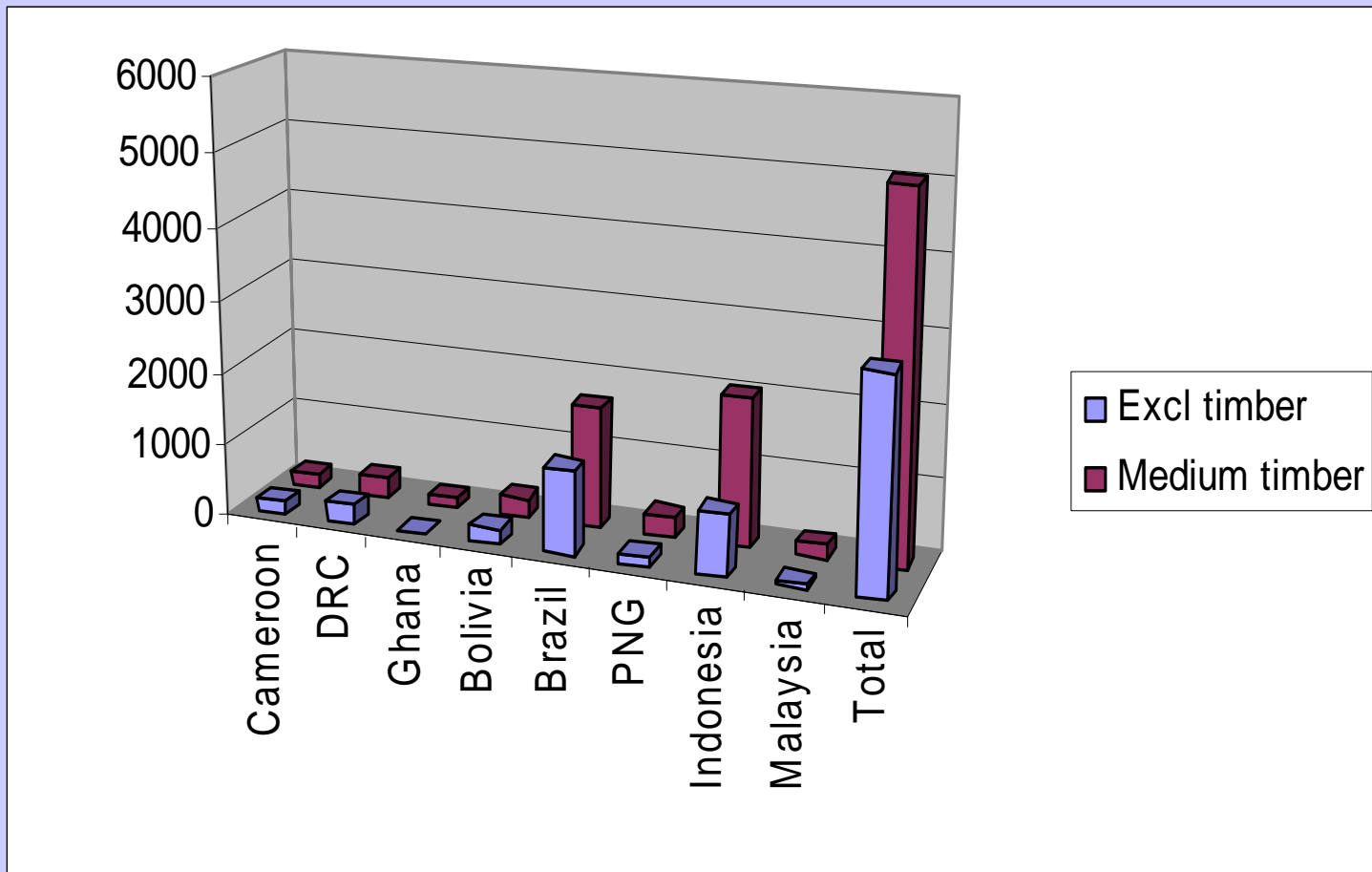
# Opportunity Costs (US\$m)

## Medium timber harvesting





# Opportunity costs with and without timber harvesting before conversion (US\$ mn)





## From costs/ha to costs/tonne CO<sub>2</sub>

- Estimates of LUCF for tropics vary!
  - 4 billion t CO<sub>2</sub>/yr  $\pm$  1 1990s/early 2000s Achard et al 2004
  - 8 billion t CO<sub>2</sub>/yr  $\pm$  0.6 in 1990s Houghton 2003
- WRI national level estimates highly uncertain  $\pm$ 150%
- Carbon stocks/ha depend on:
  - Type of forest , density of species, and the region
  - Differences between estimates – FAO and others



# Costs per tonne of CO<sub>2</sub>

Assume (very conservatively):

- 71.5 tonnes of carbon/ha/forest (world mean)
- 90% released on forest clearance = 64 t C/ha

6.2 mn ha of avoided deforestation  
= 0.4 billion t C or 1.4 billion t CO<sub>2</sub>

Average costs = US\$2-10/t CO<sub>2</sub>

Marginal costs = US\$0.01-11.5/t/CO<sub>2</sub>

Average price in CDM in 2006: US\$11/t CO<sub>2</sub>



# Administrative costs PES experience

- National level schemes
  - Costa Rica – 7% ceiling
    - US\$3 per contracted ha/year
    - But applicants incur costs also
  - Mexico – 4% ceiling
    - US\$1.5 per ha/year on cumulative basis
    - US\$4-6/ha/year if new applications only
- Local level schemes
  - Pimampiro, Ecuador: US\$12-19/ha/yr



# Administrative costs

- Range based on PES experience:
  - US\$4-19/ha/year
  - = US\$38-179/ha NPV (30 years 10%)
- At 64 tonnes carbon per ha
  - Adds US\$0.2-0.8 per tonne CO<sub>2</sub>



# Conclusions

- Paying for avoided deforestation could be cost-effective mitigation
  - Costs are comparable with CDM prices
- But significant challenges with cost implications:
  - Targeting forests most at risk, preventing leakage
  - Measuring and monitoring forest carbon
  - Implementation in contexts of poor governance, tenure insecurity, limited institutional capacity



# Thank you!

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