Avoided Deforestation: How Costly? How Powerful a Tool?

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Why Protect Forests?

Argued there are very large Non market values, largely as ecosystem services. Ask the question, what value would the market place on these?

What Ecosystem Services? Water management, air purification, erosion control, wildlife habitat, endangered species habitat, etc.

- Constanza et al. (1997) estimated at $16 to $54 trillion annually.
- Heavily criticized.

– **Pharmaceutical inputs: argued that great values as inputs into drugs, etc.**
  - $23.7 million per untested species (Principe 1989)
  - But Simpson et al. (2006) as much lower.
  - Rausser and Small higher again (2000)
  - Costello and Ward (2006) - settled the issue arguing for a relatively low value.
– **Carbon Values: First recognized by Pearce (1996) that these values could be huge.**

Table 2: Estimates of the Value of Global Ecosystem Benefits

Unit	Value of Benefits	Authors and Sources
Global Ecosystem Services	Globally $16 to $54 trillion annually.	Constanza et al. (1997)
Carbon Capture Globally for 4 billion ha	$12 trillion net benefits	Extending Pearce's (1996) approach globally

Why are forests important for climate change?

- The IPCC suggests that forest carbon releases due largely to deforestation account for 18 % of the build-up of GHGs in the atmosphere.
- So, if this is correct, mitigating deforestation, almost all of which is in the tropics, could very substantially reduce increases in the build-up of atmospheric CO2.
- Recent studies have suggested that consideration of forest carbon and especially control of tropical deforestation could reduce costs of meeting GHG targeted reductions by 50% the costs.

Forests and Carbon: How does it work?

- Plant Growth involves the withdrawal of CO2 from the atmosphere.
- The carbon is captured in the plant cell and oxygen is released into the atmosphere.
- Forest have the advantage of cumulative growth over decades or centuries and so can hold large amounts of carbon in the tree cells.

Mechanisms Whereby Tropical Forests Impact the Climate

- Tropical forests are a huge repository of carbon.
- To the extent forests contract, they release carbon into the atmosphere (except where timber is used in wood products, which continue to sequester carbon).
- Tropical Forests can contract either by a reduced land area in forests or by reduced density of forest stands, or both.

The Role of Forests in Carbon

- Trees, being perennials, accumulate mass over the years. More mass means more captive carbon.
- **Existing forests** are like silos, holding large volumes of carbon.
- So **expanding** forests sequester carbon while contracting forests release it,
- By **managing** its forests, society can expand its sequestration of carbon.

Current Situation

- Conventional Wisdom is that Tropical forests are contracting rapidly.
- Deforestation is occurring at about 10 million hectares annually, with much of the wood destroyed and its carbon released.
- Most tropical deforestation in just eight countries.
- One-half of all deforestation in Brazil and Indonesia.

New Attention Being Paid to **Avoided Deforestation**

- Idea to focus efforts on reducing tropical deforestation in developing countries
- New thrust: recognized how significant a source of GHG deforestation is.
- Over one-half of deforestation in two countries: Brazil and Indonesia.
- Question: How best to implement such an approach and who will pay?

Financial Incentives to Promote Avoided Deforestation

- Direct payments to keep land in tropical forest (opportunity costs of land)
  - Pay landowner
  - Pay government
  - Relevant others (the poor?)
  - Pay locals to enforce deforestation ban?
- Or, credits for maintaining sequestered carbon
  - Could trade credits on climate exchanges
  - Payments to locals in credits?

Carbon Credit system may be very difficult to implement effectively. Need to adhere to the trading system.

Table 3: Some Estimates of the Costs of Tropical Forest Protection

Estimate (year)	Percent Protected	Cost
Sedjo (1992), Chathamhouse (2007)	10 percent of closed forest (335 million ha) area, e.g., biodiversity hot spots.	$6.65 billion annually (rental)
James (2001)	10–15 percent forest land	$17.5-27.5 billion annually (rental)
Pimm et al (2001)	1.4 percent tropical forest	$30.0 billion for land purchase.
Brumer (2001)	2 percent terrestrial area.	$28.5 billion annually
Pearce (1996)	100 percent forest are Latin America	$500 billion one time, or $25 billion annually discounted at 5%.
Grieg-Gran (2006)	6.2 million ha/yr (1.5%) each year for indefinite period or an accumulation of about 1.5% of the global forest annually	$5 billion purchase payment and $25–$100 million each year for administration
Kindermann et al. (forthcoming)	Reduce rate of deforestation 10% And 50%	Cost is PV $4.0– $12.0 billion for the period through 2030; for a 10% reduction case PV of costs $17.2–$28.0 billion for the period through 2030 for the 50% reduction case

Some Recent Cost Estimates

- 10% reduction in tropical deforestation over period 2005-2030 would cost:
  - 0.3-0.6 Gt CO_2 at $0.4-$1.7 billion or about $2/ton CO_2 undiscounted. (Kindermann et al. forthcoming in PNAS)
- 50% reduction would involve:
  - 1.5-2.7 Gt CO_2 at $17.2 to $28 billion or about $10/ton CO_2.

Another Estimate: Focus efforts on high deforestation areas

- Grieg-Gran (2006) Target to reduce deforestation 6.2 million ha/yr (1.5%) each year for indefinite period or an accumulation of about 1.5% of the global forest annually.
- $5 billion purchase payment plus **$25–$100 million** each year for administration.
- Costs could be higher if financed via expensive carbon credit system.

Some Problems with AD

- Problem: Leakage: Suppose protect one are but the effect is to
  - a) deflect deforestation pressures elsewhere or
  - b) to raise market prices increasing overall financial incentive to deforest.
- Verification: Measurement and Monitoring, Technically feasible with satellites and 3D techniques.
- Difficult for monitoring very large areas if also trying to catch leakage situations.

Carbon Credits

- Incentives in the form of certified carbon credits for reduced carbon emissions are now being transacted in carbon markets.
- Could have credits for carbon sequestered in new forests, and/or for sequestration due to Avoided Deforestation.
- Need confidence that credits are real.
- May distinguish between Temporary and . Permanent credits: One time credit vs. credit over time (Rental of carbon sequestration services).

Current Situation: Credits for Forest Carbon in the Kyoto Protocol

- Countries given some potential carbon credit ceilings from managing their forests.
- Also, forestry projects can generate credits under the CDM. But only limited use thus far (one project).
- Bureaucratic requirements (and costs) are huge.

Caveat: Some new data

- Fang et al. In progress argue that new data, which combines FAO and satellite data, suggest:
  - Less forest carbon emissions than commonly believed.
  - Carbon losses due to forest land conversion are being more than offset by increasing growing stock density in remaining forest areas. Find net tropical forest increase of 2.6 billion m3 (Global increase of 4.95 billion m3).
  - Implication: Conflicts with IPCC estimate (18%). Also, suggests that although reducing deforestation might improve the carbon situation, the potential might not be as great as commonly estimated.

Conclusions

- Biological Sequestration, particularly of forests, is important (necessary?) to Achieving Successful Mitigation.
- Direct implementation costs likely to be relatively low,
- But, need a) monitoring system to certify credits and b) trading market to value and distribute them to users.
- Also, difficult to see how the payments could effectively be funneled to the poor.
- Costs could be higher since payments may be made through a complicated carbon credit system.