

# Is tackling deforestation a cost-effective mitigation approach?

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**Tropical deforestation is estimated to contribute 20-25% of global CO<sub>2</sub> emissions each year. Tropical forests have particularly high carbon stocks, holding on average 50% more carbon per hectare than forests in temperate and boreal areas. They are also experiencing the highest rates of deforestation. The Food and Agriculture Organisation estimates deforestation to equal 13 million hectares per year, most of it in tropical countries. It is surprising therefore that deforestation in tropical countries has been given so little space in the mechanisms of the Kyoto Protocol. The Clean Development Mechanism (CDM) notably allows credits for afforestation and reforestation but not for avoided deforestation. There have been several recent calls from governments of countries with tropical forest, notably Papua New Guinea, for financial mechanisms to provide positive incentives for developing countries to reduce their emissions from deforestation.**

How much money would be needed to provide positive financial incentives to reduce deforestation and how this would compare with other types of emission reduction measures? For this we have to look at what is driving deforestation, and the economic incentives to clear forests. Landholders clear forests because given the skills, finance and technology available to them, they can get a higher return from converting the forest to agriculture or ranching than they can from sustainable forest management or forest conservation. By paying landowners enough to compensate them for what they would have

earned from the land over time if they had deforested it, incentives can be provided for conserving forest. The returns from alternative land uses to forest are therefore a good indicator of the minimum funding required to tackle deforestation. Much deforestation takes place to convert land to relatively low return uses. This suggests that the financial incentives may not need to be very high to reduce deforestation very significantly.

The payment for environmental services schemes in Costa Rica and Mexico provide an idea of a possible approach to tackling deforestation. In Costa Rica, landowners enrolled in the national payments for environmental services scheme are paid US\$64 per ha for conserving their forest. In Mexico, communities which protect their forest are receiving US\$27 per ha or US\$36 if they have cloud forest.

Rough estimates of the minimum compensation requirements have been made by IIED for a selection of countries with extensive areas of tropical forest and significant threat of deforestation. The eight countries examined were Cameroon, Democratic Republic of Congo, Ghana, Brazil, Bolivia, Indonesia, Malaysia and Papua New Guinea, which together account for 6.2 million ha of annual deforestation worldwide, nearly half the world total. The main alternative land uses to forest were identified in each country, and estimates of returns to land discounted over 30 years made, drawing from data on land use returns from existing studies. A significant challenge was to determine how much of the annual deforested area would correspond to each different type

## KEY MESSAGES:

- **Tropical deforestation is estimated to contribute 20 to 25 per cent of global carbon dioxide each year but is not addressed in the Kyoto Protocol mechanisms.**
- **Controlling deforestation could be relatively cheap with estimated costs to reduce deforestation worldwide by roughly half at US\$5 billion. Based on compensating for the foregone returns from alternative land uses, this equates to US\$2-10 per tonne of CO<sub>2</sub> avoided.**
- **A significant challenge is to target the forestland most at risk. In practice a larger area will need to be compensated in order to achieve the desired reduction in deforestation.**
- **The financial incentive schemes would need to be designed carefully and be accompanied by a package of measures to address poverty and protect the vulnerable.**

of land use. Another factor which affects the results is the extent to which there is commercial logging as part of the forest conversion process. In some parts of the world revenue from timber harvesting may help to finance subsequent forest clearing. In other places, because of distance to markets, forests are burnt to clear them for agriculture and little commercial logging takes place.

The estimates of the costs of foregone land use if deforestation in these eight countries is to be completely halted, range between US\$3 billion (no commercial logging) and US\$6.5 billion (all areas logged before clearing) with a central estimate of US\$5 billion in a realistic scenario which takes account of practical, legal and market constraints to timber harvesting. These estimates depend heavily on the assumptions about alternative land use patterns. But an upper bound to these estimates of US\$11-15 billion per year is given by a scenario in which the highest return land use in each country was to extend to the whole annual deforestation area.

To put these estimates into perspective it is necessary to convert them into cost per tonne of carbon dioxide. The amount of carbon in forests varies considerably depending on location and the degree of degradation. Taking FAO's global average of carbon stocks in living biomass in forests (71.5 tonnes of carbon per ha) as a very conservative estimate and assuming that 90% of this would be released on forest clearance, gives a total annual reduction in emissions of CO<sub>2</sub> of 1.4 billion tonnes. The cost per tonne of CO<sub>2</sub> avoided ranges from US\$2 to 10 (highest return land use and timber harvesting) with a central estimate of US\$3.5. This compares favourably with the average price per tonne of CO<sub>2</sub> equivalent in the CDM in 2005, which was roughly US\$7.

The estimates are also highly dependent on the extent of additionality and leakage. Costs would be higher if governments are not able to identify and target the areas most at risk from deforestation or are unable to prevent displacement of deforestation to other areas. This would mean that a larger area would need to be compensated to achieve the desired reduction in deforestation. This is a challenge that has faced other payment for environmental services schemes. Research on the Mexico payment scheme has shown that in 2003 and 2004 only 11% and 28% of the forest land included in the scheme respectively was considered at high risk from deforestation.

Administrative costs for a scheme to control deforestation would be highly dependent on the nature of the measures taken. There would be some fixed costs of setting up systems for monitoring deforestation and carbon, but ensuring that there are adequate finances to implement a compensation scheme each year will be more challenging. The existing payment for environmental services schemes in Central and South America provide some indication of annual

operational costs if a system of compensating individual forest owners were adopted. From these schemes, a lower bound figure for annual administration costs of US\$4 per ha and an upper bound of US\$15 per ha can be derived. Annual administration costs associated with payment schemes compensating for 6.2 million hectares of avoided deforestation would therefore range from US\$25 million to US\$93 million. This seems relatively small but to maintain this reduced rate of global deforestation over time will require substantial increases in administration cost each year. In the second year, compensation payments would need to be initiated for another 6.2 million ha and payments made for the 6.2 million ha from the first year. By year 10, annual administration costs would range from US\$250 million to just under US\$1 billion.

Such a scheme has potential to benefit rural livelihoods as it could provide a stable income to forest land owners at least as great as their current options and open up new income generating possibilities such as eco-tourism, but there are significant risks involved. As with most payments for environmental services initiatives, the extent of local livelihood benefits depends on the detail of the scheme: who is eligible for payment, the level of payment, and the accompanying measures to build capacity. The compensation scheme would have to be implemented as part of a package of measures aimed at improving rural livelihoods.

The estimates of the cost of tackling deforestation were prepared for the Stern Review on the Economics of Climate Change

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