

**Submission to the United Nations Framework Convention on Climate Change regarding
AWG-LCA (FCCC/AWGLCA/2008/L.7)**

Enabling the full, effective and sustained implementation of the Convention through long-term cooperative action now, up to and beyond 2012 (AWG-LCA) Ideas and proposals on the subjects of the AWG-LCA workshops scheduled for 2008 (See FCCC/AWGLCA/2008/8, paragraph 26):

“Workshop on policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries”

**Joint Submission by
The Woods Hole Research Center (WHRC)¹
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**How to Distribute REDD Funds Across Countries?
A Stock-Flow Mechanism**

ABSTRACT:

Stabilizing greenhouse gas concentrations so as to mitigate the impact of climate change is a challenge facing all economic sectors. However, despite accounting for approximately 20% of anthropogenic emissions, deforestation does not fall under Kyoto Protocol mechanisms. In the context of the Bali Action Plan (paragraph 1(b)(iii)) a workshop was held in August 2008 in Accra (Ghana) on policy approaches and positive incentives for reducing emissions from deforestation and forest degradation in developing countries. Countries made presentations on a range of issues such as, for example, the need for equal treatment in the provision of incentives for activities to reduce emissions from deforestation and for maintenance and enhancement of forest carbon stocks (forest conservation, sustainable forest management). Issues of equity were also raised stressing the need to recognize the rights of Indigenous Peoples. Finally, methodological issues arose such as how to provide financial incentives, and how to address the problem of “leakage”. The stock-flow approach, proposed here to distribute REDD funds across countries, attempts to address some of these issues by separating the incentives for lowering current deforestation rates and those for the maintenance of the existing carbon stocks. The mechanism functions by negotiating a common price paid to avoid emissions from deforestation, while a portion of REDD funds are distributed as a dividend per ton of standing forest carbon stock to avoid leakage. The approach is compatible with any potential developments towards full carbon accounting. The dynamic incentives put in place by compensating stocks would stimulate early action.

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Proposed approaches to distribute REDD funds across countries

If a REDD mechanism is approved funds will have to be distributed independently of whether the adopted mechanism is market-based or fund-based. This paper, after briefly reviewing existing proposals for REDD mechanisms to provide incentives to curb emissions from deforestation, introduces a new approach based on an analogy between carbon and the returns on a financial stock.

Several approaches have been proposed: here we present background information for the more significant options proposed up to this point:

- *Compensated reductions approach* - The first REDD mechanism to be proposed used the concept of “compensated reductions” (Santilli et al., 2005). This innovative mechanism would operate at the national level and link payments to a country’s success in reducing recent deforestation rates. The approach would solve the leakage issue within each country, a major drawback of project-based approaches whereby reduction in deforestation in a target area is counterbalanced by an increase in other areas. However, by targeting only those countries with higher deforestation rates in the recent past, it poses some equity issues and does not solve the threat of international leakage. Countries that are currently conserving their forest might increase their rates in the near future if they cannot benefit financially from the adopted mechanism to reduce deforestation.
- *Expected emissions approaches* – To address issues of country participation, approaches were proposed that would distribute funds to each country based, completely or in part, on the reduction it achieved in comparison to its “expected emissions” (i.e. what it would emit assuming it deforested at the global average rate). *Strassburg et al. (2008)* suggest a hybrid mechanism where compensation is a weighted average of compensated reductions and the pure expected emissions approach. Researchers from the Joint Research Center (JRC) of the EC had previously suggested a similar hybrid approach, but with the difference that countries would be compensated according to whether they are high deforesting countries or low deforesting countries (*Mollicone et al., 2007*).

The expected emissions approaches address international leakage that would occur if no compensation were to be available for countries with historically low deforestation rates. However, the economic rationale of this approach is weaker than the compensated reduction approach where a country’s compensation is a straightforward result of emissions reduction. For an approach to be accepted there must, however, be a clear rationale on how the funds are to be distributed.

The stock-flow approach: a new perspective on the issue

The above proposals are important steps in the right direction; however, a more intuitive economic underpinning can be given if the mechanism is specified appropriately. We propose here that:

- ✓ stored carbon is an asset that should provide a return over time (dividend), where carbon flowing out of storage into the atmosphere is to be considered a depreciation of the asset, whereas carbon flowing into storage can be considered an investment.³
- ✓ The economic entity or international organisation associated with coordinating compensation for the forest carbon asset can be viewed as a multi-national enterprise, which compensates providers (countries)

³ Creating incentives for investment in new carbon stock could be complementary with projects funded through the Clean Development Mechanism, taking care not to double count forest payments.

who avoid depreciation of its capital stock (by avoiding deforestation) and pays dividends to its stockholders.

- ✓ The stream of revenues would come from the value on the carbon market of the reduction in emissions relative to a global historical baseline (but could also come from an international fund, or a combination).

The stock-flow mechanism, by providing an asset status to the carbon stock, avoids the leakage problem and one can interpret the payment for avoided emissions as an extra payment for parts of the “carbon enterprise” that are particularly effective in generating revenues (by participating in lowering global deforestation below the baseline). The incentive to reduce deforestation for a country is tied both to the avoided emissions payments and to the flow of dividends that comes from keeping the carbon stored in forests.

By construction this mechanism is such that the sum of the revenues distributed to the countries is equal to the total revenue received from international sources for the global reduction in deforestation. If a country exceeds its historical emissions rate then the country’s dividends will be reduced by the value of the excess emissions at the international market price for carbon so as to avoid any reduction of dividends to other countries. If these costs exceed the country’s dividend revenue then they will receive no payment and a debit is carried over to be discounted from future revenues. One possibility, as has already been proposed by some countries, would be for countries to set aside some credits to cover potential future debits.

Box1. How to calculate a country’s REDD funds according to the stock-flow mechanism

STEP 1: Each year the reduction in emissions is the difference between the global baseline emission and the actual global emissions that year. If this difference is positive then the funds available to be distributed as incentives (T_i) are the product of the reduction times the price (PC) of an avoided ton of CO₂ (either through the carbon market or through an international fund).

$$\text{Global Funds} = \text{Price of Carbon} \cdot (\text{Global Baseline Emissions} - \text{Global Emissions})$$

STEP2 : Global funds will be distributed to countries as dividends for their carbon stock and as bonus payments for avoiding physical depreciation of the stock (by reducing deforestation). The next step is therefore to decide how much to compensate avoided deforestation and how much to distribute in dividends. The premise here is that a country providing the service of avoided deforestation must be compensated at least the opportunity cost of forgone activities and any transaction costs associated with administering and enforcing an avoided deforestation program. Empirical studies indicate that the difference between projected future carbon market prices and the cost of limiting deforestation is sufficiently large that a reasonable payment rate for avoided emissions (PAE) would leave considerable funds to distribute as dividends to carbon stockholding rainforest nations. The bonus revenue for avoiding emissions from deforestation relative to historical emissions is:

$$\text{Avoided Emission Revenue} = \text{Price of Avoid. Emiss.} \cdot (\text{Country Baseline Emiss.} - \text{Country Emiss.})$$

STEP 3: The global funds remaining after distributing the avoided emissions revenue are distributed as dividends (DIV) per unit of carbon stock. The dividend is obtained as the ratio of these remaining funds divided by the sum over all participating countries of their carbon stocks.

STEP4: Depending on country’s i carbon stock (C_i), the total REDD revenue for country i is then:

$$\text{Total Revenue} = \text{Avoided Emission Revenue} + \text{DIV} \cdot C_i$$

Advantages of the stock-flow approach

Reducing emissions from deforestation and degradation has established itself as an important option in the policy toolkit for combating climate change. In the process, the debate has shifted from whether to pursue REDD, to how to implement it, and the challenges involved. How to finance forest-related initiatives – whether through a market mechanism, a fund, or a combination of the two – and what to finance are among the issues being discussed. In this respect, several countries (Brazil, India, China, Guyana, Indonesia, Malaysia to cite a few) expressed the need for incentives to be included also for sustainable forest management, and the maintenance and enhancement of carbon stocks (Climate Change Talks, Accra, Ghana, August 2008). Given the current context, the stock-flow approach:

- avoids leakage since revenues to be distributed are based exclusively on reduction of emissions from deforestation at the global level
- provides a positive incentive to maintain or enhance terrestrial carbon stocks
- is fair in that it compensates deforesting countries for costs incurred in reducing emissions while rewarding all participating countries with the same level of incentive to maintain or enhance carbon stocks because the dividend paid for a ton of carbon is the same for all countries
- is compatible with full carbon accounting. In the stock-flow approach carbon flowing into storage could be considered an investment in the forest carbon stock and be eligible for recovering investment costs and to receive dividends.
- intrinsically provides for credit for early action. Introduces transparent, dynamic incentives by explicitly linking dividend payments to the carbon stock, so that even if a mechanism takes 15-20 years to become fully operational, countries will have an incentive to reduce deforestation early to have a larger stock of carbon for which to claim dividends.

An additional advantage of the stock-flow mechanism is that the only value that must be negotiated is how much countries should be compensated per ton of avoided CO₂ emissions below their baseline. This price paid for avoided emissions (P_{AE}) can be negotiated either in absolute terms (as a monetary value per ton of CO₂) or relative to the market price of carbon. Furthermore, the negotiated price P_{AE} is a useful tool because if it were adopted in the context of a market mechanism, it can be negotiated so as to mediate between supply and demand, thereby limiting to some extent the impact of a REDD mechanism on the carbon markets. Countries avoiding emissions from deforestation will see P_{AE} as an incentive to limit emissions and not the full price of carbon on the global market (PC_t). This is equivalent to controlling the supply of REDD credits that enter the market, but done through the pricing structure rather than imposing a quantity limit.

A Simple Example

Next we work through an example where we assume that five countries participate in a stock-flow REDD mechanism as proposed here. The countries are chosen based on their characteristics in terms of forest carbon stock and deforestation rates so as to have a representative coverage of country types. We limit the example to five countries for the sake of simplicity and without a loss in generality.

Countries in Table 1 are reported in order of decreasing forest carbon stock. One notices the qualitative difference between countries, with Brazil having the highest stock and highest emissions, Indonesia's emissions in second place but with a much lower stock base (implying a higher deforestation rate). At the other extreme there is China with a substantial stock of forest carbon, but no emissions from deforestation (and actually reforesting). The Democratic Republic of Congo with the second largest forest carbon stock, has a relatively low deforestation rate (0.3%), whereas Papua New Guinea has an intermediate deforestation rate (0.5%).

Figure 1. Carbon stocks: relative size

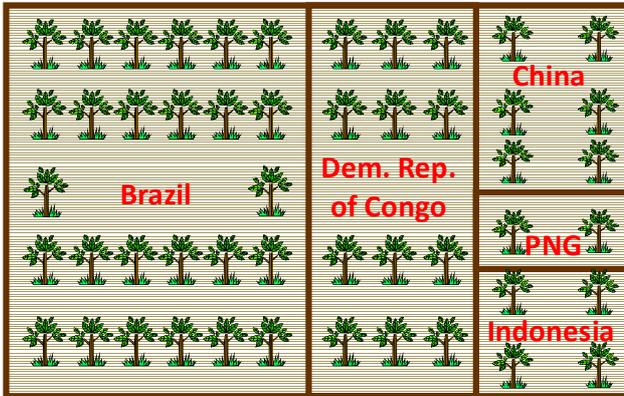


Table 1. Forest Carbon stocks and emissions of CO2 of participants

	Forest Carbon Stock (Mill. tC)	Emission rate (Mill. tCO2)	Deforest. Rate (%)	Forest carbon share
Brazil	58794	1183	0.55	0.550
DR_Congo	22378	246	0.30	0.209
China	12214	-767	-1.70	0.114
Indonesia	8800	597	1.85	0.082
Papua New Guinea	4785	88	0.50	0.045
Total	106971	1347		1.000

Source: Strassburg et al. (2008)

In Table 2 we present the results in terms of payments distributed using the stock-flow mechanism if each participating country reduces its emissions from deforestation by 47%. It is assumed that the price of a carbon credit is 15\$/tCO₂, and we present results for two different negotiation outcomes in terms of the price paid for avoided emissions: 5\$/tCO₂ and 10\$/tCO₂. Clearly the higher price for avoided emissions will leave fewer funds to be distributed as dividends since these are calculated based on the difference between the market value of global emissions reductions and the compensation actually paid to the countries providing those emission reductions.

Table 2. Payments assuming participating countries reduce their deforestation by 47%. We assume the price of a carbon credit to be 15\$/tCO₂.

Price paid for avoided emissions	5 \$/tCO ₂			10 \$/tCO ₂		
	Billion \$			Billion \$		
	Avoided emissions payments	Dividends	Total	Avoided emissions payments	Dividends	Total
Brazil	2.80	5.50	8.29	5.60	2.75	8.34
Dem. Rep. of Congo	0.58	2.09	2.67	1.16	1.05	2.21
Indonesia	1.41	0.82	2.24	2.83	0.41	3.24
Papua New Guinea	0.21	0.45	0.66	0.42	0.22	0.64
China	0.00	1.14	1.14	0.00 ⁽¹⁾	0.57	0.57
Total	5.00	10.00	15.00	10.00	5.00	15.00

Note: ⁽¹⁾ in this example we assume that afforestation does not receive compensation as an avoided emission, therefore China receives no avoided emissions payment. However, the approach is compatible with compensation for afforestation.

The results indicate that countries that have a deforestation rate that is around average (0.45%-0.55%), such as Brazil and PNG, are not greatly affected (in aggregate) by the value assigned to the price paid for avoided emissions (PAE). The reason is that they have a “balanced portfolio” in terms of avoided emissions revenue and dividend revenue. In these cases a lower (higher) PAE is counterbalanced by higher (lower) dividend payment.

This result is dependent on the assumption that all participating countries have a comparable reduction in deforestation rates.

On the other hand, participation in REDD for a country like China, which has no emissions from deforestation, is completely dependent on the revenue from dividends. At the other extreme, but equally affected by PAE, are high deforestation countries like Indonesia. Therefore, for these two types of countries the negotiated price for avoided emissions has a substantial impact on the aggregate revenue the country will receive from a REDD program.

Conclusions and Further Developments

The stock-flow approach proposed here has the advantage of providing intuitive incentives and having a clear economic rationale. It separates the incentives for lowering current deforestation rate and those for the maintenance of the existing carbon stock (avoiding leakage). The mechanism functions by negotiating a common price paid to avoid emissions from deforestation (P_{AE}), and the remaining funds (based on the price difference between the market price of carbon and P_{AE}) are distributed as a dividend per ton of standing carbon stock to avoid leakage. The approach is compatible with any potential developments towards full carbon-accounting. Furthermore, the dynamic incentives put in place by a mechanism that compensates stocks are an important part of the solution.

In the proposed approach, how the compensation amount is spent is up to each country to decide, implying that how funds are distributed to forest stakeholders may or may not have a link with the internationally determined price of compensating for avoided emissions from deforestation or the level of dividends. However, as a further development, the fairness of the stock-flow approach could make it an interesting candidate approach for distributing funds inside a country. One possibility would be for the government to use the stock-flow approach to distribute funds between administrative regions. At the local level one could then distribute funds to different stakeholders based on their property rights to carbon stocks and on whether they are reducing their current deforestation activities. In this context, if property rights of Indigenous Peoples are recognized, indigenous populations could benefit from incorporating a carbon dividend for stockholders. The Woods Hole Research Center and the Amazon Institute for Environmental Research (IPAM) are currently simulating case studies of how the stock-flow approach might be applied to distribute REDD funds to stakeholders in the Amazon region and the implications for indigenous people.

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