

## Establishing Efficient, Equitable, and Environmentally Sound Reference Emissions Levels for REDD+: A Stock-Flow Approach<sup>1</sup>

### Executive Summary

A “stock-flow” approach to reference emissions levels for REDD+<sup>2</sup> is a simple and workable option for establishing environmentally sound, efficient, and equitable incentives to reduce deforestation and forest degradation. It meets the needs of a broad set of Parties and therefore might be broadly acceptable in UNFCCC negotiations on reference levels. Further, the “stock-flow” approach offers a structured path for negotiations that avoids political gaming at the expense of environmental integrity. Countries that reduce their *flow* of emissions from deforestation and degradation below a historical reference emissions level would be eligible for payments as part of the results-based (or “third”) phase of REDD+. This might include market, market-linked, and non-market sources. A portion of payments for emissions reductions would be put into a “stabilization fund” that would re-allocate payments to countries based on forest carbon *stocks*. This approach would provide balanced incentive payments to conserve forests in both historically high- and low-deforestation countries, while maintaining a level of environmental integrity necessary for progress towards global REDD+ goals.

---

<sup>1</sup> This paper was prepared by Bronson Griscom ([bgriscom@tnc.org](mailto:bgriscom@tnc.org)) and Rane Cortez of The Nature Conservancy’s Climate Team. We are grateful for contributions by other TNC staff including Greg Fishbein, Erin Myers-Madeira, Jeff Fiedler, Nicole Virgilio, Hamilton Hardman, Michelle Passero, Yves Paiz, Duncan Marsh, David Ganz, and others. We are grateful for review, revisions, and other contributions by Jonah Busch, Becky Chacko, Michael Wolosin, and others.

<sup>2</sup> A reference emission level for Reduced Emissions from Deforestation and forest Degradation plus sequestration (REDD+) refers to the benchmark of gross emissions from deforestation and degradation against which performance in reducing gross emissions is measured, reported and verified. The scope of REDD+ has now been defined to include both reductions in emissions and increases in sequestration. As such, it is important to consider how reference emission levels for measuring reductions will interact with reference levels for measuring increases in sequestration. Countries seeking to receive incentives for increasing sequestration should either maintain or improve their historical rate of deforestation (i.e. countries cannot receive payments for increasing sequestration while also increasing deforestation). This principle is in accordance with environmental safeguards included in the REDD+ decision at COP-16. We support a mechanism that encompasses reduced emissions from deforestation and forest degradation (REDD), sustainable management of natural forests subject to strict environmental and social criteria and robust carbon accounting, conservation of existing natural forests and maintenance of carbon stocks including in areas with high forest cover and low deforestation rates, enhancement of forest carbon stocks through the restoration of existing but degraded forests, and increasing forest cover through environmentally appropriate reforestation.

## Introduction

Reducing Emissions from Deforestation and Forest Degradation and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks (REDD+) was included at COP-16 in Cancun as an important policy option for mitigating climate change. This year, as part of the broader negotiations, the Subsidiary Body for Scientific and Technical Advice (SBSTA) is discussing the methodological issues relating to reference emissions levels for REDD+. This discussion is critical. The design of these reference emissions levels will affect:

- the ability of the REDD+ mechanism to produce credible reductions in emissions from avoided deforestation and degradation (environmental integrity),
- the associated cost of obtaining the reductions (efficiency), and
- the distribution of REDD+ revenue across countries and regions (equity).

Proposed methods for setting reference emissions levels vary widely in their ability to achieve environmental integrity, efficiency, and equity<sup>3</sup>. Many existing proposals attempt to optimize all three of these objectives through adjustments to the reference emissions level. This approach is problematic because manipulation of the reference emissions level to achieve equity will compromise the efficiency and environmental integrity of a REDD+ mechanism<sup>4</sup>. Furthermore, if a negotiating window is opened for country-by-country adjustments to reference emissions levels, political influence is likely to dominate over technically robust considerations. Yet equity must be addressed. Apart from common-sense ethics, a REDD+ mechanism that engages as many countries as possible will minimize international leakage.

## A Stock-Flow Approach

A solution to this conundrum is achieved by establishing two linked instruments: (1) a reference emissions level that measures emissions reductions and (2) a “stabilization fund” that provides incentives for maintaining forest carbon stocks. The stabilization fund would be financed by setting aside a portion of payments for emissions reductions and re-distributing those funds to

---

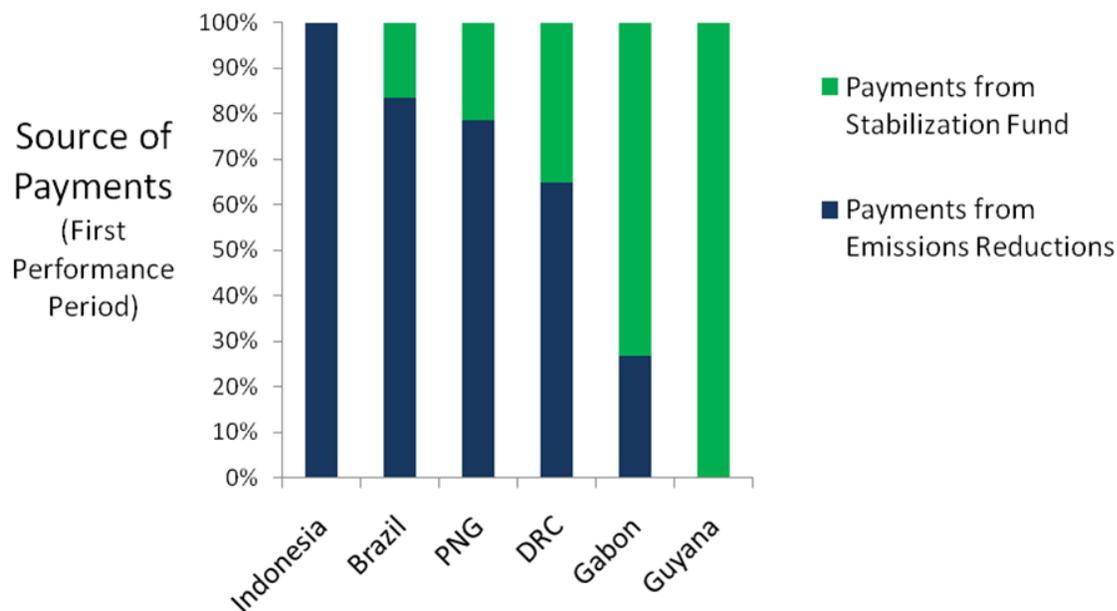
<sup>3</sup> The following studies compare proposed methods for setting reference emissions levels:

- Griscom, B., Shoch, D., Stanley, B., Cortez, R., Virgilio, N. 2009. Sensitivity of amounts and distribution of tropical forest carbon credits depending on baseline rules, *Environmental Science and Policy*. 12 (7) pp 897-911.
- Busch, J., Strassburg, B., Cattaneo, A., Lubowski, R., Bruner, A., Rice, R., Creed, A., Ashton, R., Boltz, F. 2009. “Comparing climate and cost impacts of reference levels for reducing emissions from deforestation.” *Environmental Research Letters* 4:044006.
- Cattaneo, A., Lubowski, R., Busch, J., Creed, A., Strassburg, B., Boltz, F., Ashton, R., 2010. “On international equity in reducing emissions from deforestation.” *Environmental Science and Policy*. 13(8) pp 742-753.

<sup>4</sup> For example, countries with high past rates of deforestation will have high incentives to participate given a reference emission level set at historic emissions rates; however, countries with low rates of past deforestation would have limited incentive to participate. On the other hand, if reference emissions levels were adjusted for hypothetical future deforestation rates, countries with low historic rates of deforestation may have an incentive to participate; however, “emissions reductions” credits could be generated without change in behavior, undermining environmental integrity. Further, global additionality would only be maintained if reference levels for other countries were reduced accordingly, such that initial changes in behavior in these countries would not be incentivized. While some trade-offs between equity and efficiency cannot be avoided, attempting to address all three issues through manipulation of the reference emissions level results in excessive trade-offs.

all eligible countries based on their proportion of forest carbon stocks. We offer an example of how initial payments from these two sources would vary depending upon a country's deforestation rate and stocks in Figure 1. A stock-flow approach<sup>5</sup> therefore maintains environmental integrity by ensuring global additionality against historic rates while also promoting equity by providing incentives for all countries. Modeling has shown that the stock-flow approach can achieve an equal or greater level of efficiency and cost-effectiveness compared to other approaches.<sup>6</sup>

### Example Scenario of Initial Payment Sources



**Figure 1.** The relative source of initial incentive payments under a hypothetical scenario of a Stock-Flow mechanism is given for six representative countries, across a range from high deforestation rates (Indonesia), to low deforestation rates (DRC, Gabon), and no reported deforestation (Guyana). The proportion of payment sources would shift over time as countries reduce emissions rates. For example, Indonesia could begin receiving stabilization payments once emissions fell below the global mean. Brazil represents the payment source proportion for average countries who meet eligibility criteria (see Appendix). Only payments from emissions reductions could be “credited” as offsets. Countries could opt out of the emissions reductions mechanism and still receive stabilization funds. For this scenario we assumed: (i) 15% set aside of emissions reductions payments to the Stabilization Fund, and (ii) all countries achieved 25% emissions reductions during this first performance period (using FAO data for the period 2000-2005). The percent for stabilization set asides should be determined by negotiations among Parties, with awareness of performance considerations<sup>9</sup>. The set aside rate could be reduced if other sources contributed to the Stabilization Fund (e.g. allowance auctions and ODA).

<sup>5</sup> This is a modification and elaboration from the original “Stock-Flow” proposal: Cattaneo, A. 2008. How to distribute REDD funds across countries? A stock-flow mechanism. Woods Hole Research Center. [http://www.whrc.org/policy/pdf/cop14/Stock\\_Flow\\_Mechanism.pdf](http://www.whrc.org/policy/pdf/cop14/Stock_Flow_Mechanism.pdf)

<sup>6</sup> Simulation results indicate that the stock-flow design can provide a gain in economic efficiency by providing incentives to decrease deforestation rates and incentives not to increase deforestation rates. Analysis is reported in: Cattaneo, A. 2010. Incentives to reduce emissions from deforestation: A stock-flow approach with target reductions. In: Deforestation and Climate Change, Bosetti and Lubowski, Eds.

More specifically, the two linked instruments in the stock-flow approach are:

- (1) A national reference emission level** for each country. This should be set as the average of recent historical forest emissions in each country<sup>7</sup>. This method results in a simple and credible benchmark for measuring performance (see page 5 for further discussion).
- (2) A “stabilization” funding stream**, paid to eligible REDD+ countries based on their proportion of standing forest carbon stocks. This would motivate broad participation and avoid displacement of deforestation to countries with high stocks and historically low deforestation (“international leakage<sup>8</sup>”). The stabilization fund would be supplied by setting aside a portion of emissions reductions payments. The portion of funding set aside for stock payments should reflect the potential scale of international leakage (in the absence of a stabilization fund), and the goal to maximize participation<sup>9</sup>. As such, the stabilization fund creates a stock payment linked to the scale of the overall REDD+ funding. This fund could, and should, be supplemented by public funding sources such as auction revenues and ODA to promote long-term stabilization of tropical forests.

If REDD+ were included in an offset mechanism, only emissions reductions against the reference emissions level would generate credits. Stabilization payments would not involve emissions reductions crediting, and thus no “double crediting” of emissions reductions would occur. To avoid abuse of stabilization funds, eligibility to receive stabilization payments would be determined by criteria for stabilizing emissions (see Appendix).

### ***Stabilization funding allocation and eligibility***

Stabilization funding is designed to recognize that incentives are needed to conserve forest in countries and sub-national jurisdictions with high forest stocks and low deforestation, considering that increased pressure is likely to shift to these areas if a REDD+ mechanism is successful at reducing emissions where they are currently high. Thus, stabilization funding would be allocated to individual countries based on forest carbon stocks. For example, a country which holds 5% of the total forest carbon stocks among all REDD+ countries would receive 5% of the stabilization fund (assuming all countries meet the eligibility criteria).

---

<sup>7</sup> We suggest using the average of annual historic deforestation emissions during the most recent period before 2010 of no less than five and not more than ten years for which appropriate data are available from a combination of remote-sensing and ground-level measurements. The length of the time period used to determine this level should allow for flexibility, as the robustness of the data is more important than the precise length of time over which the deforestation emissions are measured.

<sup>8</sup> The stabilization set aside can be considered a “leakage withholding,” and thus relieves the need to apply any further deductions for leakage among countries.

<sup>9</sup> Analysis of the OSIRIS model (<http://www.conservation.org/osiris/Pages/overview.aspx>) by J. Busch indicate that efficiency and effectiveness of the stock-flow approach is maximized with a 15% set aside of emissions payments for the stabilization fund.

While the quantity of stabilization funds would be allocated based on stocks, eligibility to receive those funds would depend on stabilizing emissions below designated levels. For most countries, “stabilized emissions levels” could be defined as less than the average historic rate among all REDD+ countries, and declining. An exception should be made for countries with very low historic emissions and high remaining forest, since it would be inequitable to deny such countries the opportunity to pursue a low carbon development strategy as long as stocks are relatively stable. See the Appendix for a more detailed discussion on eligibility criteria.

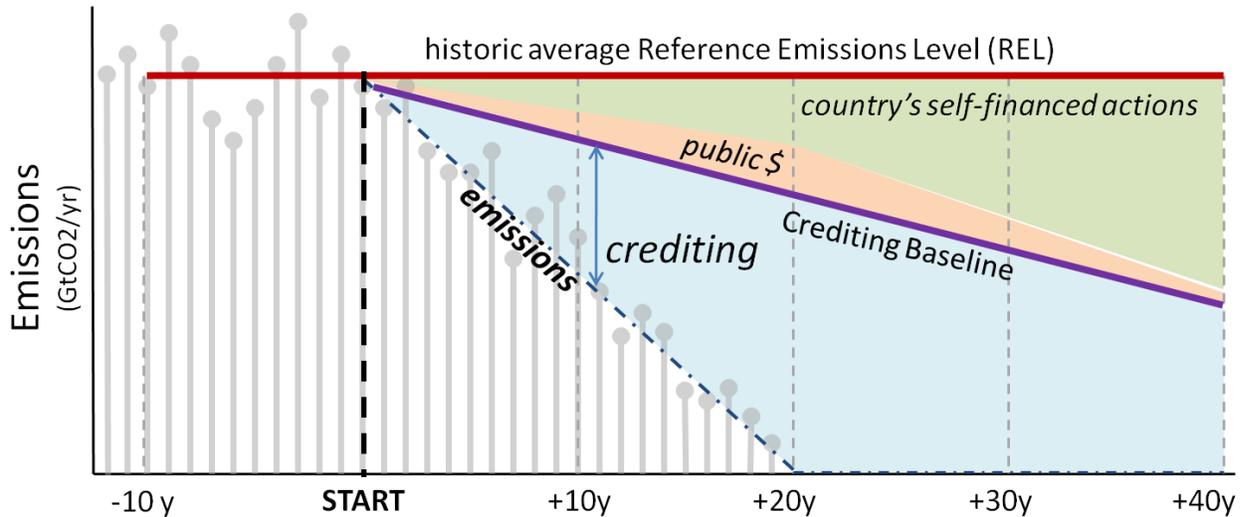
### ***Reference emission levels and pathways to zero deforestation***

In Cancun, countries agreed on a global goal to slow, halt, and reverse forest cover and carbon loss. Establishing effective, efficient, and equitable reference levels is important for achieving that goal. Under the stock-flow approach, the reference emission level is set based on a country’s historic average emission rate. Here we discuss the relationship between a reference emission level (REL) and a crediting baseline. While this relationship is not central to the concept of a stock-flow mechanism, it is an important complementary design element. The REL provides a holistic assessment of the gross emissions performance of a country. However, not all emissions reductions achieved by a country are necessarily eligible for crediting in an international market system for REDD+. A crediting baseline, nested within the REDD+ REL, is the benchmark against which marketable emissions reductions are credited. Crediting baselines can be designed to provide predictable and adequate incentive payments aimed at achieving ambitious reductions while promoting increasing investments by developing countries over time. We detail our vision as follows (summarized in Figure 2):

1. We assume three kinds of REDD+ actions may be occurring in parallel: 1) actions forest countries take themselves without outside funding; 2) actions forest countries take using public funding from outside sources, and 3) actions that are eligible for crediting and sale on international carbon markets.
2. In order to achieve an ambitious global reduction in deforestation, developing countries should commit to a stringent emissions reductions goal within a reasonable period of time. This will differ by country due to differing national circumstances, but globally, countries should aim to reduce emissions by 50% by 2020 and achieve net zero emissions from deforestation and degradation by 2030. That goal should be achieved and financed through a combination of the three actions described above.
3. Over time, REDD+ Parties should take on an increasing domestic commitment, and financial responsibility, to reduce forest emissions. A crediting baseline should be adjusted downward over time in order to increase this commitment as countries gain capacity and earlier interventions begin to create real transformations within the country. Such a declining crediting baseline could be negotiated among Parties to reflect unique country circumstances and capacities. However, at the beginning of the mechanism, many countries may not be able to finance emissions reductions themselves. For such countries with limited internal financial capacity, the crediting

baseline should stay fixed at the historical reference emission level for at least the first 10 year period before downward adjustment might begin.

4. The principles by which a crediting baseline is adjusted downward over time should be determined in advance for a balance between predictability and flexibility. Countries that succeed in reducing emissions in one period should not be penalized with a lower reference level in a subsequent period.



**Figure 2.** The distinction between a Reference Emissions Level (red line), and a Crediting Baseline (purple line) is diagramed here. Public funds from developed countries are becoming available to achieve emissions reductions outside of a formal crediting mechanism (area in orange). Over time, countries are also expected to achieve increasing emissions reductions without external incentives and crediting (area in green). The magnitude of these non-credited activities will be used to set a threshold below which emissions reductions achieved would be eligible for crediting (blue). Emissions reductions credits so generated could be transacted with public or private funding sources. Countries can receive all types of funding in parallel. Stabilization funding, also received in parallel, is not represented in this diagram because it falls outside of emissions reductions accounting (although it is contingent upon emissions thresholds as discussed in the Appendix). [Note: diagram template from Michael Wolosin.]

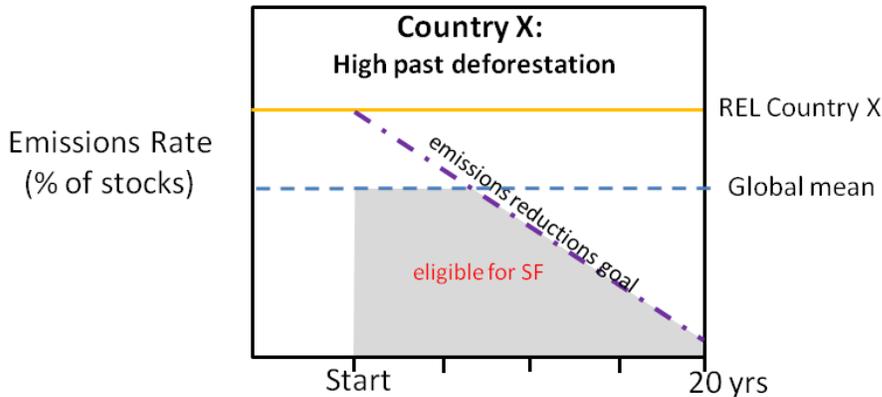
### ***A rational pathway for negotiating reference emissions levels***

The approach for establishing reference emission levels and crediting baselines described here is a healthy interpretation of the COP15 decision for reference levels based on historic emissions that are “adjusted to national circumstances.” This stock-flow approach would focus political negotiations on a balanced and transparent solution to unavoidable trade-offs in the distribution of REDD+ incentives, while avoiding political gaming at the expense of environmental integrity. If a stock-flow approach is accepted by Parties, environmental integrity would be ensured in the form of historical reference emission levels and the negotiations could focus on a debate about the appropriate proportion of funding that should be dedicated to emissions reductions vs. stabilization of stocks. This is a much less risky

negotiation to have than a negotiation on how to adjust reference emission levels for projected future emission levels. The LULUCF negotiations have provided us with a daunting example of how negotiations of that nature end up.

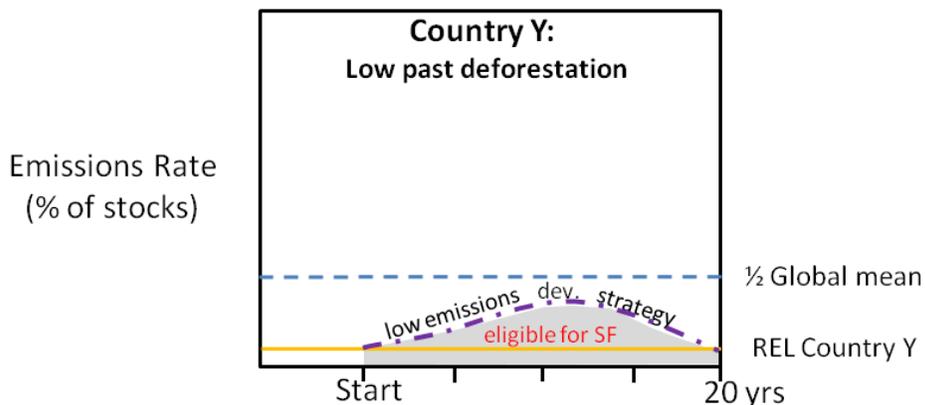
## Appendix: Eligibility Criteria for Stabilization Fund Payments

While the quantity of stabilization funds are allocated based on stocks (as discussed above), countries should meet performance criteria for “stabilized” emissions levels in order to be eligible for receiving those funds. Emissions performance criteria are critical to avoid abuse of stabilization funds – such as the use of these funds for activities resulting in high deforestation. We suggest that “stabilized emissions levels” are defined as declining emissions levels that are below the average emissions level among REDD+ countries and are at or below an established emissions reductions goal (Figure A1).



**Figure A1:** The grey area represents the zone in which Country X would be eligible to receive its full share of Stabilization Funds (SF). Country X would not be eligible to receive its share of stabilization funds until it achieves emissions rates below the global mean rate for REDD+ countries, and is following an emissions reductions goal.

These criteria should be less restrictive for countries which maintain the majority (e.g. > 50%) of their original forest cover and have maintained historic forest emissions rates below a “stabilization threshold.” We suggest defining this as  $\frac{1}{2}$  of the global average deforestation and degradation emissions rate for REDD+ countries (Figure A2). High forest, low deforestation (HFLD) countries should be eligible for their share of stabilization funds if their rate of deforestation does not pass above the stabilization threshold, and remains rational in terms of a low emissions development strategy moving towards zero net forest emissions.



**Figure A2:** Country Y has historic deforestation rates below a “stabilization threshold” of  $\frac{1}{2}$  the global REDD+ country forest emissions rate, and a majority of its original forest cover is standing. As long as Country Y maintains emissions rates in the grey zone, it would be eligible to receive its full share of Stabilization Funds (SF). This would allow Country Y to pursue a low emissions development strategy that may involve temporary and limited emissions increases, towards a goal of net zero forest emissions.