Defining Forest Degradation for an Effective Mechanism to Reduce Emissions from Deforestation and Forest Degradation (REDD)

Sean Cadman October 2008[1]

Background

At the request of the Bali COP, SBSTA convened a Workshop on Methodological Issues relating to Reducing Emissions from Deforestation and Forest Degradation in Developing Countries in Tokyo in June 2008. At the workshop, the Climate Action Network (CAN) presented a set of principles to aid Parties in their deliberations on an effective REDD mechanism. CAN's Principles include a definition of forest degradation in terms of the impact human land use activities have in degrading carbon stocks.

At Tokyo, Parties agreed that an expert workshop on forest degradation was needed. The workshop on forest degradation will take place in Bonn on 20-21 October. CAN has been invited by the Secretariat to nominate one expert participant.

In this document a rationale is set out for a scientifically based carbon stocks and flows approach to defining forest degradation. Terms are defined and related to other proposed definitions. Finally, methodological approaches and mechanisms aimed at reducing emissions from forest degradation and deforestation consistent with the proposed definitions are set out.

Defining forest degradation

CAN base their proposed definition of Forest Degradation following Mackey et al.[2] :

> "Despite the progress we are now seeing in the development of international policy responses to the problem of deforestation, there remains a lack of clarity about the kinds of human activities that contribute to forest degradation. From a climate change perspective, **forest degradation needs to be defined to include the impact of all human land-use activity that reduces the current carbon stock in a natural forest compared with its natural carbon carrying capacity**. The impact of commercial logging on natural forests must therefore also be considered when accounting for forest degradation. As discussed earlier, commercially logged forests have substantially lower carbon stocks and reduced biodiversity than intact natural forests, and studies have shown carbon stocks to be 40 to 60 per cent lower depending on the intensity of logging (Brown et al. 1997; Dean et al. 2003; Roxburgh et al. 2006). In Brazilian Amazon, the area of natural forest that is logged commercially resulting in degraded carbon stocks is equivalent to that subject to deforestation and represents approximately 0.1 Gt of green carbon emissions to the atmosphere (Asner et al. 2005)" (emphasis added).

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[1] Sean Cadman is the principal consultant with Cadman & Norwood Environmental Consultancy, works as a forest consultant to The Wilderness Society in Australia and is the expert nominated by CAN for the Bonn workshop.

[2] Mackey et al. (2008). Green Carbon: The role of natural forests in carbon storage. Part 1. A green carbon account of Australia's south-eastern Eucalypt forests, and policy implications. Australian National University Press, Canberra; p36; http://epress.anu.edu.au/green_carbon_citation.html

The language contained in the text above provides the rationale for the following definition of forest degradation:

"Forest degradation is the reduction of the carbon stock in a natural forest, compared with its natural carbon carrying capacity[3] [0], due to the impact of all human land-use activities.[4,5]"

Importance of a Comprehensive Definition

This work and its proposed definition identify a very significant consideration, that of carbon carrying capacity. Intensive land use activities in natural forests degrade carbon stocks and maintain them well below carbon carrying capacity. Thus, carbon carrying capacity of a natural forest provides a baseline for assessments against which changes in carbon stocks (emissions from "degradation") can be measured. Using this baseline means that degradation can be readily determined and quantified. If the degradation activities persist, and the degradation of carbon stocks continues, the loss of carbon can be accounted for. The degradation may be reversible. However, if degradation is permanent and irreversible, as in the case of deforestation, then the permanent loss can be determined. The significance of this is summarized below:

> "Given the extensive impact of human land-use activities, particularly land clearing and all forms of commercial logging, carbon carrying capacity has to be estimated carefully in many landscapes from the best available data. If the carbon carrying capacity is not considered explicitly, the current carbon stock will be taken as representing the baseline against which future changes are gauged. Assuming there is a history of intensive land use, the result will be an underestimate of the green carbon account. The landscape's potential for carbon storage will have been undervalued." Mackey et al 2008 (*loc. cit*. p. 33-34)[1]

Failure to fully account for emissions due to forest degradation so defined, leads to a false sense of neutrality of climate impacts due to forest management practices. The sustainability of these practices is already widely questioned. Reduced impact logging produces better environmental outcomes, and real financial benefits can be shown to accrue to the practice. Even in these circumstances, financial benefits cannot necessarily be successfully translated into a sufficient incentive to secure a long term change in practices without subsidies [6]. Failure to account for the full economic benefits of climate

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[3] Carbon carrying capacity (CCC) is defined as the mass of carbon able to be stored in a forest ecosystem under prevailing environmental conditions and natural disturbance regimes, but excluding anthropogenic disturbance; See Gupta, R.K. & Rao, D.L.N. (1994) Potential of wastelands for sequestering carbon by reforestation. *Current Science*, **66**, 378–380.

[4] The definition of forest degradation provided by CAN's REDD Principle 8.2 has been further elaborated here in order to provide effective guidance for activities that are genuinely capable of achieving emissions reductions.

[5] Forest degradation is thus defined without reference to arbitrary definitions of forest or deforestation based on forest cover.

[6] Holmes, T. P., et al. (2002). Financial and ecological indicators of reduced impact logging performance in the eastern Amazon**.** *Forest Ecology and Management* **163***:93-110.*

[7] Curran, L. M., *et al.* (2004). Lowland Forest Loss in Protected Areas of Indonesian Borneo**.** *Science* **303**: 1000

mitigation arising from reducing emissions from forest degradation also creates a perverse bias favoring the financial value of extractive forest practices and the conversion of natural forests to plantations.

Understanding the potential amount of carbon in an ecosystem and the difference between the economic value of its full protection and restoration compared to status quo management, is critical to ensuring that parties participating in REDD schemes adopt well-informed policies.

Logging and associated road building in tropical forests is, in many instances, the precursor to accelerated degradation due to additional intensive human land use activities, culminating in deforestation[7],[8],[9]. Krug 2008[10] illustrates this quantitatively. She demonstrates that 30% of the areas studied progressed to full deforestation within the study period, another 40% had an ambiguous outcome, while only 30% recovered after logging was abandoned in its early stages.

The implications are clear: degradation entails a reduction in carbon stock, compared to the carbon carrying capacity of the forest. In some circumstances the reduction in carbon stocks can be long term or permanent, implying that management has modified the forest ecosystem to an extent that exceeds the thresholds of its natural resilience. Thus, carbon stocks are unlikely to fully recover, the composition and structure of the forest ecosystem is permanently modified, and in more extreme (though still common) cases a natural forest is not maintained. This is why it is useful to see that degradation is often the beginning of a process on a continuum which begins with a forest undisturbed by human activity and ends with even less forest cover than an arbitrary deforestation threshold. Consequently, successful REDD requires early intervention to replace conventional logging practices and forest conversion with a combination of forest conservation (protection), traditional forest subsistence practices (which can help to permanently suppress additional intensive forest land use activities), and a dramatic reduction in the extent and intensity of logging. Accounting protocols to ensure that this can happen will need to be developed.

The optimal outcome for reducing the concentration of greenhouse gases in the atmosphere has two components. First, is to maintain forests that are currently at carbon carrying capacity in that condition. Second, is to restore the carbon carrying capacity of forests that have been degraded to the point of being incapable of natural regeneration.

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[8] Foley et al. (2007). Amazonia revealed: forest degradation and loss of ecosystem goods and services in the Amazon Basin. *Frontiers in Ecology and the Environment* **5(1)**: 25–32.

[9] Bikié, H., et al. (2000). An Overview of Logging in Cameroon. World Resources Institute, Washington DC.

[10] Krug, T. (2008). Detection of Selective Logging for Estimating and Monitoring Forest Degradation: methodologies and experiences in Brazil. Paper presented to the UNFCCC Workshop on Methodological Issues relating to Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.
Tokyo, Japan, 25-27 June, 2008.

Activity-based approaches to reducing emissions from degradation

Forest degradation due to logging and other intensive activities is the source of significant carbon emissions.

Assertions have often been made that, for example sustainable forest management does not harm or may enhance forest carbon. A claim made that any given activity does not degrade forest carbon and or the carbon carrying capacity of a forest needs to be capable of being empirically validated.

There are human activities in natural forests that may cause minimal forest degradation as defined here, i.e. in terms of reducing current carbon stocks below their carbon carrying capacity. It is logical to treat low thresholds of degradation that cannot be detected (e.g. some human forest subsistence practices), as effectively zero. Importantly, the communities in which these practices are common can play a significant role in ensuring that intensive land-uses and related degradation does not occur; particularly if the real value of the carbon stock is established and they are beneficiaries of its protection.

Successfully monitoring forest degradation

It is difficult to monitor and account for the carbon stock of a partially degraded natural forest and to predict its future dynamics under a particular harvesting or extractive regime. However, reference sites in undisturbed areas can be used to establish forest carbon carrying capacity for previously disturbed forests.

Consequently, it is very important to establish at the earliest opportunity a list of forest degrading activities whose emissions have been quantitatively established, rather than to rely on unsubstantiated claims that certain activities have negligible, temporary and naturally reversible impacts on carbon stocks and the carbon carrying capacity of the forests. The use of both field plots and remote sensing data will be critical in establishing these data at appropriate scales for all relevant forested landscapes.

The use of appropriate scales of assessment is important because very few landscapes are naturally homogenous. The Canadian boreal is a good example. When determining carbon carrying capacity at the whole of landscape scale then CCC will reflect the fact that these ecosystems naturally contain a matrix of ecosystem types and age classes as the result of natural disturbance regimes and different substrates, amongst other factors that cause landscape heterogeneity in carbon stocks. However if the land use activity, for example logging, is targeting predominantly old-growth - the most carbon dense element of the forested landscape - then the activity will have a disproportionate impact on the carbon carrying capacity of the landscape as whole.

Research work should focus on differentiating the vegetation ecosystem elements in the landscape. Vegetation maps not only provide an important tool for forest carbon assessments but are also invaluable in helping set priorities for biodiversity conservation[11]. Field plots used to validate or create vegetation maps should be established as full ecological plots in largely undisturbed areas so that they can be used to establish carbon carrying capacity. When monitored over time these plots can provide information about how carbon carrying capacity is being affected by climate change in otherwise undisturbed sites.

Research to establish the natural carbon carrying capacity of forested landscapes, described by Mackey et al[1,12] as the "green carbon baseline" can be carried out now so that when large financial resources are mobilized for REDD then activities can be appropriately incentivized to reflect their relative benefit in emissions reduction. This work while vital should not prevent early action by parties provided a precautionary approach is taken with the emphasis on protection of forests.

How Does the Definition Relate to Others?

A review of existing definitions of forest degradation was carried out in 2007 by FAO[13] for the UNFCCC.

The FAO identified a set of criteria that should be applied to definitions for use in UNFCCC negotiations and processes:

> "• they should be unambiguous and serve the purpose, i.e. assessment of carbon stock changes and greenhouse gas emissions and removals resulting from an activity;
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> • definitional parameters should be measurable during assessments;
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> • definitions should permit synergies and cost effective assessment and reporting, e.g. by being compatible with, or building on, related assessment and reporting processes." (*op. cit.* p. 1)

The focus of REDD is emission reductions from forest degradation and forest deforestation. Forest degradation is a continuum with deforestation being the fairly arbitrary end point in that continuum The last two decades have seen a large increase in the conversion of natural forests to industrial fuel/food and fiber plantations. Forest

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[11] Decision on Biodiversity and Climate Change UNEP/CBD/COP/9/L.36, Decision on Biodiversity and Climate Change UNEP/CBD/COP/9/L.36 Annex III

[12] See also Roxburgh, S.H., Wood, S.W., Mackey, B.G., Woldendorp, G. & Gibbons, P. (2006) Assessing the carbon sequestration potential of managed forests: A case study from temperate Australia. *Journal of Applied Ecology* 43:1149-1159.

[13]Schoene, D., W. Killmann, H. von Lüpke, M. LoycheWilkie. (2007). Definitional issues related to reducing emissions from deforestation in developing countries. *Forests and Climate Change Working Paper* **5**. Food and Agriculture Organization of the United Nations. Rome.

conversion produces very large emissions of CO_2 even though the woody crop that replaces the natural forests meets the definition of forest under the current canopy structure and height based definition and therefore is not regarded as deforestation. This serves to highlight the need to define forest degradation in terms of carbon, not forest structure. In this context conversion to plantations not only produces high emissions but ensures that stocks of carbon remain well below the carbon carrying capacity of the forests that have been replaced.

In addition, definitions that focus solely on canopy extent grossly misrepresent the carbon dynamics of the greatest sources of emissions from deforestation and forest degradation: tropical forested peat lands. The majority of emissions from peat soils are responses to disturbance of their hydrological regime, independent of their forest cover.

The definition proposed in this paper focuses on the mitigation issue facing Parties to the UNFCCC, which is the response of carbon stocks in forests to direct human induced disturbance. Introducing carbon carrying capacity as the baseline allows a consistent relative assessment of the impact of all such activities, including logging and the conversion of natural forests to plantations

The proposed definition of forest degradation is closely aligned with two definitions proposed by the Intergovernmental Panel on Climate Change (IPCC)[14]:

> "direct human-induced activity that leads to a long-term reduction in forest carbon stocks" (IPCC, 2003:14); and,
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> "the overuse or poor management of forests that leads to long-term reduced biomass density (carbon stocks) (IPCC, 2003:15).

The proposed definition is focused on the role of humans and on reductions in carbon stocks. The definition of degradation should not include a 'long-term' time frame because at this point the natural functionality of the forest may well have collapsed. The two definitions above do not have a baseline against which to measure (long-term) reductions. We argue that the carbon carrying capacity of the undisturbed forest is a logical baseline and entirely consistent with the Framework Convention's ultimate mitigation goal - allowing ecosystems to adapt naturally. Most importantly the proposed definition is capable of being implemented.

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[14] IPCC, 2003. Definitions and methodological options to inventory emissions from direct human-induced degradation of forests and de-vegetation of other vegetation types. Institute for Global Environmental Strategies, Japan.