In REDD, the second D is for Degradation

A policy note from the Kyoto: Think Global, Act Local project

This short paper has been written as a contribution to the on-going discussions on technical issues related to REDD (Reduced Emissions from Deforestation and Degradation in Developing Countries), a policy which is currently under consideration by the UNFCCC (Decision 2/CP.13). It focuses on the question of **reducing forest degradation** and how this concept can be operationalised in a practical manner so that carbon saved by measures that combat degradation may be recognized and credited.

Under UNFCCC definitions, ***deforestation*** *refers to loss of area of forest: the conversion of forest land to some other type of land use. Although no formal definition has yet been adopted for* ***degradation*** *(Penman et al 2003), it is clear that from a climate change point of view, it means reduction of biomass and thus of carbon stock within forest, while the land remains forest.*

The paper has been prepared by the Kyoto: Think Global, Act Local, a research and capacity building project which is particularly concerned with strengthening Community Forest Management approaches in tackling climate change.

Kyoto: Think Global, Act Local (K:TGAL) is a research and capacity building project sponsored by Netherlands Development Cooperation, which has been working since 2003 on the potential role of community forest management in mitigation of climate change. It is led by the University of Twente with the support of ITC (in the Netherlands) and its main partners are ICIMOD (Nepal), ENDA (Senegal), Sokoine University of Agriculture (Tanzania), and Treeness Consult.

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1. Why is degradation important?

There are two reasons why inclusion of degradation is very important in REDD; for integrity of the instrument, and because degradation is responsible for a large proportion of tropical forest emissions.

Integrity of the REDD instrument

Every country has its own definition and classification system as regards forest, but under UNFCCC a definition has been adopted which relates to area, canopy cover, and height. The minimum area that can be declared forest is 0.05-1. ha, it must have a canopy cover above a cut-off point in the range between 10 and 30%, and the average height of the trees at maturity must be at least 2-5m. The thresholds on these three parameters are selected by each country individually on the basis of ecological properties of the forest, and are valid for all forest in that country.

Under the Compensated Reductions model as first proposed for REDD (Santilli et al. 2003; Moutinho and Schwartzman, 2005) deforestation would be calculated in area terms, after which a local multiplier for each ecotype would be used to convert area to biomass and hence to carbon stock and potential carbon dioxide emissions.

> *Dry forest biomass (the dry weight of living plants) consists of approximately 50% carbon. One ton of carbon in a tree is equivalent to about 3.75 tons of atmospheric CO_2.*

However, it is evident that under these rules, a country might halt loss of forest area completely, but instead thin out the forest such that the canopy cover drops to a level just slightly above the cut-off point. Huge losses in biomass would take place, but this would not register as deforestation at all, meaning that a country would then essentially be able to claim false credits.

Recognition of this has led to the explicit inclusion in Decision 2/CP.13 of ‘forest degradation’ in parallel with deforestation.

Degradation is a major contributor to emissions

The first thing to note is that degradation is in most cases not simply an early step on the way to full deforestation. Many uses of forest degrade it but do not result in clearance, even in the long run.

It is often said that the loggers cause degradation, but that in their wake, and along the logging roads that have been opened up, come the poor settlers who clear the forests completely for farming. Although this pattern is well established in some areas, for example in parts of the Amazon, it may be the exception rather than the rule. Many forests are subjected to gradual degradation year after year, changing totally in biological character – but still remaining forest.

Degradation is caused by a variety of processes. In the estimates of emissions from tropical forestry that have been made by IPCC, emissions from selective logging and some other wood removals which cause degradation in humid forests have been included. These activities can at least to some extent be detected through the use of remote sensing when they disturb the canopy; moreover, to the extent that they are “governed” activities, there will be some national statistics which can be used to make such estimates. However a great deal of degradation, particularly in drier and less commercially valuable forest areas, is not brought about by these essentially commercial processes but by the pressure of local populations that are dependent on forest for fuel and for fodder and grazing, or who practice low level shifting cultivation (slash and burn) in the forest areas. These activities, which are in the informal sector (thus “ungoverned”), are difficult to detect in remote sensing images because they are low density and spread over long time periods. Moreover, they are not usually included in official statistics relating to forest use. Nevertheless, they result in considerable carbon emissions. We have estimated that the emissions from this sort of degradation may exceed the emissions from deforestation in countries with mainly dry forests in which a high proportion of the population is involved in subsistence agriculture (Skutsch et al. 2008).

2. Measuring and monitoring degradation

Degradation is manifested in small clearings in the canopy, and gradual losses of biomass below the canopy, which cannot be measured and monitored using standard optical remote sensing methods since their resolution is too large and the changes are too small, or too hidden, to be detected either visually or by computer analysis (DeFries et al., 2007). Developments in remote sensing technology may in time address this, particularly very high resolution optical imagery (which could pick up small holes in the canopy), radar imagery (which gives higher accuracy in establishing biomass and can work under cloudy conditions) and lidar (laser) soundings, which can yield a 3-dimensional picture of the forest, and thus estimates of woody biomass (Lefsky et al., 2005). The problem is that all of these techniques, at least at present, involve very high costs and expertise which is not widely available.
The options are therefore either to use default data (i.e. data which is not specific to particular locations) or to do detailed, ground level surveys.

Use of default data

The IPCC Good Practice Guidance for Land Use, Land-Use Change and Forestry (IPCC, 2003) provides a three tier methodology system for forest inventory. Tier 1 uses very simplified data (e.g. generalized default values for carbon stock in different forest types, based on global literature), while Tier 2 is based on region or country specific (but not site specific) data. Both of these rest on the use of default values, which are of necessity very conservative, and their use would result in low levels of claimable carbon. The advantage would be that the transaction costs are low, since only secondary data is required.

Use of ground level surveys

Tier 3 is based on site specific data. In most countries, such forest inventory data is currently not available, and the only practical way to obtain reliable estimates of forest biomass levels, and changes in these over time, is to make ground level assessments using standard forest inventory methods in sample plots. Use of such Tier 3 methods implies that much more of the carbon actually saved could be claimed. There is therefore always a pay-off in terms of the cost of gathering more accurate data versus the value of the extra carbon credits.

Significant amounts of data on the state of forest resources can however be gathered very cost-effectively by local stakeholders. This contention is based on findings of the K:TGAL research project which has been working in 25 locations in Africa and Asia where Community Forest Management was already being carried out.

Community Forest Management (CFM) is a general term used when forest owned by the State is handed over to local communities for management. A contract or agreement is reached in which in return for rights to certain forest products, the community agrees to regulate off-take through by-laws or customary law. These measures have been particularly successful and cost-effective in reversing degradation and promoting sustainable management of forests in areas where the opportunity costs are relatively low. It has been less successful in areas of high timber values where commercial pressure for logging is too strong to be resisted.

In each of these locations groups of community residents with no prior experience and only 4 to 7 years primary education were taught in a few days to map their forest area using a handheld computer (PDA) equipped with GIS and GPS facilities, measure a set of primary forest parameters used to calculate biomass (DBH, tree height, species identification) and report these measurements in a standard format on the PDA. Checks against 'professional' forest inventory in the same areas have shown that the local people's data is within acceptable levels of reliability.

The costs are very low: from $2 to 10 per ha/year, including the use of the PDAs and technical support from NGOs. Although the K:TGAL worked with communities, any forest owners or users could carry out this kind of inventory on a regular basis if accurate data were to be required for participation in a national REDD programme.

The advantages of acquiring this data extend far beyond the immediate application under REDD, since they could also support other forestry programmes and initiatives, including bio-diversity assessments. They would enable much more accurate reporting to FAO and other such agencies.

3. Baselines and reference scenarios for degradation

Baselines (reference scenarios) for deforestation may be based on past rates of change of forest area as derived from remotely sensed images repeated over given time intervals. However, there is in general no systematic historical data on rates of degradation, even at the national level. In the FAO's 2005 Global Forest Resources Assessment study, very few developing countries reported on degradation (i.e. on decreases in the biomass density of forests) over the periods 1990-2000 and 2000-2005, despite the fact that all but the most inaccessible forests have in fact been subject to chronic disturbance. The reason for the lack of reporting is because no regular forest inventories have been carried out.

However, degradation baselines will be essential under REDD for two purposes: to control for leakage from avoided deforestation (the integrity issue), and to claim credits on avoided degradation. Our contention is that even though under REDD national baselines or reference scenarios will be used in calculating carbon credits for distribution at the international level, in practice such baselines will have to be constructed from the bottom up, not only to increase accuracy but also to create the basis for a workable system of incentives for the national REDD programme, as will be discussed below. We use the term 'nested baselines' for this concept, although this term has also been used in some submissions to the UNFCCC (e.g. from Chile) to mean baselines for individual projects, which may not sum to a national baseline in the way conceived here.

Thus, though a national default degradation value could be based on conservative estimates from the few studies that have been made, and fixed for example at 1 or 2 tons of biomass (approx 2 to 4 tons of CO_2) per ha/year, this would probably not create much of an incentive in financial terms. Such an approach suffers from the fact that degradation rates are locally often much higher than this, and thus the counter-degradation measures will actually be saving considerably more carbon than the default value shows. The alternative might be a modelling approach based on local socio-economic surveys which assess the off-take of forest products per head of population, and project this both backwards and forwards on the basis of population growth, for which records are generally available at the local level. This could be combined with estimates of degradation due to commercial extraction (i.e. degradation due to non-local uses) partly from remote sensing and partly from records on concessions and logging permits.

The sum of local degradation baselines would form the national degradation baseline for use in international carbon crediting.

4. Forest enhancement: the other side of the degradation coin

Measures introduced to counter degradation processes, such as CFM, will generally not only halt the degradation, but also increase the level of woody biomass in the area and result in forest enhancement, potentially until the ecological maximum for that ecotype is reached. If the management includes controlled off-take of some forest products, as is usually the case in CFM and sustainable forest management, a high rate of carbon sequestration may be maintained for a very long period. Forest enhancement (sometime referred to as "forest restoration") is thus the other side of the degradation coin, and if avoided degradation is measured and credited, then it would seem logical that enhanced carbon stocks are also included. Introducing forest enhancement under REDD, however, implies a conceptual shift, since it means crediting increased sequestration (increased sinks), as well as decreased emissions, and it implies a move to something approaching full carbon accounting, at least in the forest sector. But it makes sense from the point of view of rationalising forest management and reducing atmospheric carbon dioxide, since carbon sequestration may be larger than the component of degradation avoided, as shown in Figure 1.

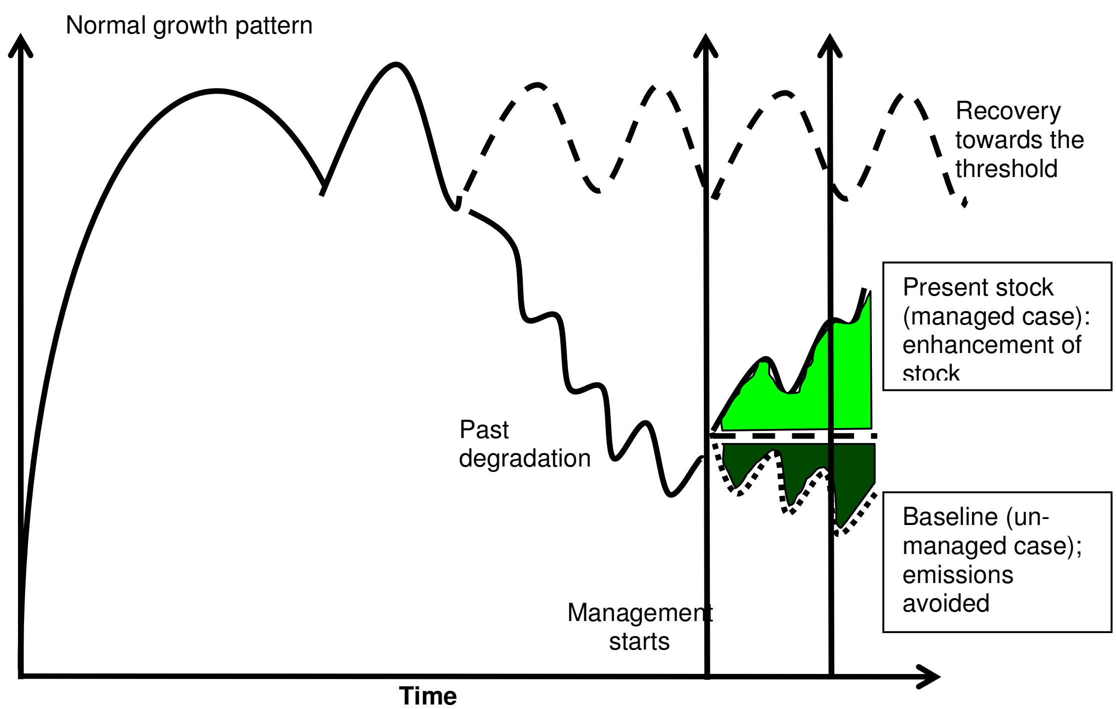

Figure 1: Management leads to both avoided emissions and enhanced stock

Measurements made across the K:TGAL research sites indicate that forests under community management in dry areas (700-1000mm rain per year) are increasing their CO_2 storage at rates at between 1.5 and 5.5 tons/ha/year, while those in mountain areas (rainfall around 1700mm) increase at 5.5 to 11 tons/ha/year. This is on top of the avoided degradation, for which estimates at different sites vary between 2 and 6 tons/ha/year.

5. Verification of carbon credits

If tradable carbon credits are issued for REDD achievements, it is likely that independent agencies will be licensed by UNFCCC to ensure that such credits are valid. Given the huge areas of forest that will potentially fall under REDD

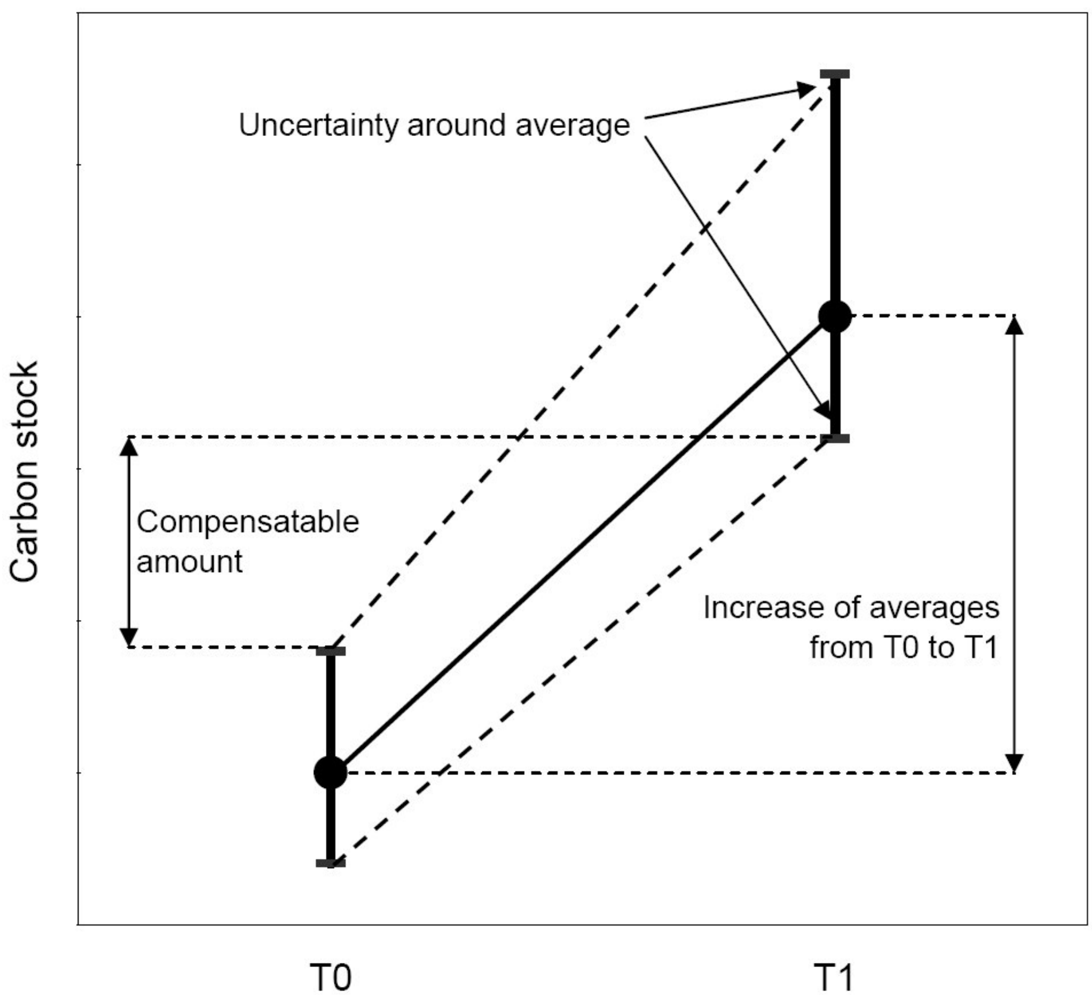

Figure 2: Uncertainty of estimates is likely to result in conservative crediting

(the entire forest estate of all participating countries) it is clear that verification will have to be done on the basis of sampling, either using very high resolution satellite imagery, spot check on the ground, or both. Considering the uncertainties involved in data for monitoring, baseline construction and verification, the issue of accuracy and precision in forest observation becomes very significant. Emission reductions from deforestation and degradation will in all probability only be certified for that amount which has been realized *beyond doubt*. It is quite possible therefore that the *upper limit* of confidence at some statistical level of significance of forest biomass at the onset of the commitment period will be compared to the *lower limit* at the end of the period, as shown in Figure 2. In other words, large margins for safety will be built into the crediting system, which can only be reduced by ensuring high quality data and high reliability of estimates. The implications of this uncertainty principle have probably not been fully understood by many countries yet. Without good data, many countries may find the incentives to participate in REDD insufficient. Local collection of data is cost-effective and may be a good solution to this.

6. Building a national REDD programme with degradation components

The components of a national REDD programme are considered a matter of national sovereignty and not the concern of the international community. How the state allocates its financial returns from REDD will also not be within the purview of UNFCCC. Nevertheless it is clear that there are several ways in which funds can be used, and a national REDD programme is likely to be made up of several different parts.

Since REDD is to be implemented at national, rather than project level like CDM, it is clear that resources will be required for a central agency to manage the whole programme, including preparation of baselines and measuring and monitoring changes in forest area and forest stock. In addition, funds may be required to oversee compliance to existing or new laws and regulations in the forest sector, both for personnel and for equipment.

Setting up new programmes or extending old ones (for example, for community forest management, or for conservation areas) may also require resources. Finally, there is the possibility for direct payment to forest users as an incentive to change the way forest is used, which may or may not be directly in proportion to the amount of carbon saved, through Payment for Environmental Services systems or PES.

Most degradation processes are not in the formal sector and thus they are unlikely to respond to policy measures which seek to enforce existing laws; they have in fact flouted these laws for years. However, as shown above, community forest management programmes have been rather successful and very cost-effective in reversing degradation and enhancing forest biomass levels, particularly in drier forests with relatively low timber values, as a result of 'power-sharing' between local people and government. CFM offers one component that could be included in a national REDD programme, targeted to areas where degradation is occurring as a result of local community uses of forest. Here, REDD funds could be used either to support state efforts to extend CFM, or directly through a carbon PES system, in proportion to the amount of carbon saved locally, or simply to pay forest users to make the forest inventories that will be essential if the state is to make the carbon claims.

7. Protecting the rights of forest dependent people

Voices have been raised in the debate on REDD regarding its potential negative impacts, for example as regards the fate of forest dwellers and populations traditionally dependent on forest, since an authoritarian forest conservation policy might seek to alienate such people from their traditional resource base. For this reason there is a paragraph in Decision 2/CP.13 which "recognizes that the needs of indigenous and local communities should be addressed", although the question remains open as to how this will be done in practice.

Relating carbon crediting to CFM makes sense not only from an operational point view (cost-effective carbon savings), but also from an ethical and rights-based one. As shown in this document, the state is unlikely to be able to claim its full quota of carbon credits unless ground level measurements are made by local forest users, because of the need for detailed and locally accurate statistics. In making such measurements part of their regular forest management tasks, communities are also establishing their 'ownership' over the carbon stocks. Commitment to pay a share of the monetary value of the carbon credits directly to the communities responsible for producing them would indicate commitment to the rights of the forest users.

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