# Reducing emissions from deforestation and forest degradation (REDD)

Brief notes prepared with support from

and in cooperation with

Analysis of 7 outstanding issues for the inclusion of tropical forests in the international climate governance

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# Foreword

For its own merits and thanks to the mobilization of academic, economic and political stakeholders, the reduction of emissions from deforestation and forest degradation (REDD) has taken a prominent position in international debates on climate governance.

The horizon of major choices is coming closer. The United Nations Framework Convention on Climate Change should decide by end of 2009, at the end of the process engaged with the Bali Plan of Action adopted in December 2007 (Decision UNFCCC 1/CP.13). The Bali Plan of Action engages Parties to the Climate Convention to think through (§1biii):

> **« *(…)Policy approaches and positive incentives on issues relating to reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries;* »**

The French inter-ministries/inter-agencies taskforce on tropical rainforests wished to expand its basis for thoughts on 7 outstanding issues, namely:

a) Baseline construction
b) Scope of the mechanism
c) Monitoring techniques
d) Financing
e) Scale
f) Permanence
g) Implementation of national strategies

ONF International was contracted by the French development agency (AFD) to facilitate the appropriation by the taskforce of the extensive body of literature published in recent years on REDD, also based on the experience gained by ONF International teams on forest management and climate mitigation activities in most tropical regions of the world.

The results of this short study are presented in this document in the form of 7 thematic brief notes corresponding to the 7 outstanding issues identified above.

# Acknowledgments

The brief notes were prepared by Nicolas Grondard, Cyril Loisel, Anne Martinet and Jean Baptiste Routier of ONF-International. ONF-International is consultancy specialized forest management and climate mitigation. Cyril Loisel is also coordinating the climate/energy programme of Iddri, the Institute of sustainable development and international relations.

The team is grateful for the guidance and feedback from Denis Loyer, Guillaume Ernst and Thierry Liabastre from the French development agency, Olivier Bouyer, Ministry of agriculture, Corentin Mercier, Ministry of ecology and Marie Anne Vautrin, Ministry of foreign affairs. The content of this document is without prejudice to the French government's positions on these issues though.

The elaboration of the brief notes also greatly benefited from various discussions with a large number of experts in many countries.

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## A - Baseline construction

### 1. *Deforestation drivers*[1]

Deforestation results from a complex combination of factors. Most of them do not operate at the forest level, but originate from other sectors. The literature classifies deforestation causes into three levels (Geist & Lambin 2002; Kaimowitz & Angelsen 1998, Kanninen et al., 2007):

- § Direct, immediate or proximate causes refer to the direct actions of deforestation agents. They consider agricultural activities, forest products extraction or infrastructure expansion.
- § Indirect or underlying causes refer to background societal factors influencing deforestation agents' behaviour, especially economic, technological, demographic, policy, institutional and cultural factors.
- § Other factors include enabling environmental factors, biophysical drivers and social trigger events.

Direct causes of deforestation differ significantly across countries, leading to different patterns of deforestation. The following graph illustrates outstanding causes by regions based on data from Geist & Lambin (2002), also taking into account that deforestation usually results from combination of causes.

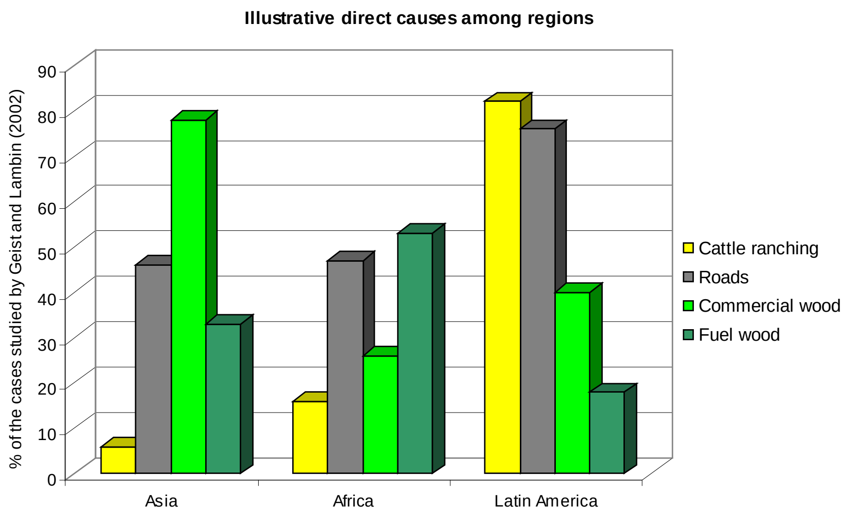


Figure 1: Outstanding causes of deforestation by region, based on Geist & Lambin, 2002

If deforestation causes are well identified, their quantification remains challenging, especially when it comes to the impact of indirect factors. The complex combination of various causes, underlines the need for multi-sectoral approaches to achieve a reduction in deforestation, as demonstrated by Geist & Lambin (2002).

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[1] This section does not address degradation because degradation drivers have been far less studied than deforestation. Current studies will provide more information on it very soon.

## 2. Approaches for baseline construction

The terms "*baseline*" and "*reference scenario*" may refer either to a counterfactual storyline or to a set of figures reflecting GHG emissions and removals under that storyline. In modalities and procedures for afforestation and reforestation activities under the CDM (CDM AR M&P paragraph 19), the baseline is defined as "*the scenario that reasonably represents [what] would have occurred in the absence of the proposed project activity*." While the term "*baseline*" hints at a CDM-like policy approach to REDD, the Bali Roadmap preferred the term "*reference level*", that may also suggest a base-year approach similar to the treatment of Annex I Parties commitments under Kyoto Protocol.

Net reductions in GHG emissions are assessed against that baseline. The construction of reliable baselines has been one of the main obstacles to the emergence of a REDD mechanism under the UNFCCC framework. Indeed, trusting hypothetical scenarios to determine the amount of credits granted to developing countries is quite unconvincing.

Building a baseline aims at determining the amount of deforestation that would occur in the absence of the REDD mechanism, and also where it would occur in order to increase the precision of GHG emissions estimation. The different methods for baseline construction differ in the way of calculating the amount of deforestation.

Baselines may be elaborated at the national, regional or project level. Current UNFCCC negotiations appear to lead toward national baselines, therefore avoiding subnational leakage. Arguments in favour of the different baseline scales are presented in the scale section of this document. This section focuses on national reference levels.

The determination of national reference levels for the forestry sector faces two main challenges:

§ Encouraging countries with high current deforestation rates to participate in a REDD mechanism, and also engage countries with low historical levels of deforestation. As shown in Table 1, 85% of tropical developing countries forest carbon is located in countries that have had low historical deforestation rates (below 0.63% per year); this is the reason why they should not be neglected.

§ Baselines should neither be too restrictive nor too flexible in order to promote broad international participation and avoid large amounts of hot air.

· Table 1: A typology of tropical developing countries according to their deforestation rate for the period 2000-2005[2].

| | Annual deforestation rate | Number of countries | Proportion of forest area | Proportion of forest carbon | Some countries |
|---|---|---|---|---|---|
| **High deforestation countries** | > 0.63% | 19 | 25% | 15% | Indonesia, Cambodia, Honduras |
| **Low deforesting countries** | < 0.63% | 26 | 75% | 85% | RDC, Brazil, Mexico, Gabon, Vietnam, India |

[2] The data source is FAO Forest Resource Assessment, 2005 for 45 tropical developing countries. Selected countries are developing countries (according to IMF classification, published in April 2008 : http://www.imf.org/external/pubs/ft/weo/2008/01/weodata/groups.htm#oem), located in the tropical zone, and with a forest cover over 5 million ha in 2000. 0.63% was the average deforestation rate in selected countries over the 2000-2005 period. Information on carbon stocks was lacking on 6 countries in the FAO FRA 2005, so we approximated it by using carbon contents in neighbouring countries.

## 2.1 Historical vs. projected baselines

The Bali REDD Roadmap (paragraph 6) states that: "reductions in emissions or increases resulting from the demonstration activity should be based on historical emissions, taking into account national circumstances".

The use of historical baselines was first suggested by Papua New Guinea and Costa Rica at the COP 11 in Montreal in 2005. And it is now supported by Brazil among other countries. Under this method, historical emissions during a given period are projected into the future, considering that deforestation will be occurring at the same rate as in the past. If historical rates are used, appropriate years and time periods need to be selected to develop the reference deforestation and emission rates. To deal with lack of credibility and non-participation of countries with low deforestation rates, it was proposed by Papua New Guinea to use a development adjustment factor (DAF).

· Table 2: Comparison of historical and projected baseline approaches

| | Effectiveness | Efficiency | Equity | Feasibility | Credibility |
|---|---|---|---|---|---|
| **Historical baselines** | (+) in the short term, rapid decrease of emissions through the participation of high deforesting countries<br>(-) in the mid-term, international leakage from high deforesting countries to current low deforesting countries (not encouraged to participate in the mechanism) (Eliasch Review, 2008) | (-) in the medium-term, risk of hot air: countries with high deforestation rates and small residual forest cover will see their deforestation decrease irrespective of public policies and will benefit anyway (Karsenty, 2008).<br>(-) the use of an inadequate DAF may also increase the risk of hot air | (-) low deforesting countries will not be rewarded for maintaining high forest cover<br>(+) these countries could be included by using a DAF<br>(-) but the use of a DAF increases the risk of political pressure (Combes Motel et al., 2008) | (+) Easy to implement and transparent (provided consistent methods are used to assess emissions in the base year / base period and emissions over the accounting period) | (-)Inadequacy over longer time period,: forest transition and saturation phenomena |
| **Projected baselines** | (+) theoretically it avoids the risk of leakage<br>(+) by involving all countries, it could lead to greater emission reductions | (+) theoretically it avoids the risk of hot air thanks to a sounder scientific basis for forecasting<br>(-) but the complexity of the models may prevent proper deliberations of UNFCCC negotiators over their output. This may lead to overestimating business as usual deforestation rates | (+) with a good estimation of key variable evolution, it could be possible to include all types of countries, even low deforesting countries | (-) all countries do not have the ability to obtain the necessary data and build this sort of model (high transaction costs)<br>(+) historical emissions may be used to project a baseline in absence of better information | (+) theoretically, econometric models provide a sounder scientific basis for forecasting business-as-usual emissions<br>(-) model findings may not be accepted by parties (lack of transparency, unreliable hypotheses on variables)<br>(-) the choice of indexation variables is subject to political pressure |

A projected baseline is an anticipation of future emissions through econometric models based on a regional panel of past deforestation data and a set of explanatory variables. These key variables are supposed to approximate the structural forces behind the behaviour of deforestation agents. Their evolution is particularly difficult to forecast in a context of unknown crop and energy prices. Even if the output of these models does not directly lead to agreed reference levels, they can help inform these decisions and also guide the elaboration of proper national REDD strategies.

We compare both approaches in Table 2, regarding carbon effectiveness and efficiency, and also political acceptance (estimated through equity, feasibility and credibility). Effectiveness refers to the net positive effect on climate, whereas efficiency focuses on the performance in relation to expenditure.

It is worth noting that these approaches are also being considered for the treatment of LULUCF activities in Annex I countries post 2012. In this other negotiation, the historical baseline approach is referred to as the "net-net" approach with a base year or a base period, and the projected baseline approach has been introduced as the "*forward look baseline*" (FLB – see FCCC/KP/2008/L.11).

This distinction also prevails in CDM AR M&P (paragraph 22): the historical approach corresponds to approach (*a*) in there ("*Existing or historical* […]") while the projection approach relates to approach (*b*) or (*c*) ("[…] *a land use that represents an economically attractive course of action, taking into account barriers to investment*"; "[…] *the most likely land use at the time the project starts*."). CDM AR M&P offer a choice to project participants among these approaches but they must justify their selection through the methodology.

### 2.2 Static vs. dynamic baselines

Some authors suggest that baselines must be dynamic with regular adjustments. When the rate of deforestation is declining in a country, the baseline should be adjusted downwards with regular intervals, in order to encourage continued reduction of deforestation rates and avoid the phenomenon of hot air.

According to the Eliasch review (2008), there are two potential ways of adjusting baselines: periodical negotiations or an automated adjustment based on a pre-agreed pathway. Periodic negotiations may allow for more flexibility to adapt to unforeseen circumstances and progresses in scientific knowledge, but the more often adjustments are realised, the more political pressures may adversely affect the incentive structure (Karsenty, 2008). Therefore, the credibility of the mechanism will also depend on the renegotiation frequency. Using a predetermined trajectory is more transparent, and avoids political interference threatening the environmental integrity of the mechanism. The optimal solution would be a combination of both approaches: a baseline renegotiation based on an indicative trajectory.

Wherever historical data show that annual deforestation rates are highly volatile and strongly correlated with structural or exogenous factors (GDP growth, population growth, international commodity prices, etc.), Parties may also deem appropriate to allow baselines to be indexed on such factors. In that case, the truer reference level, including the effect of exogenous deforestation drivers, would be revealed over the course of the accounting period as indices values are recorded and fed into the pre-agreed baseline formula. Again, CDM AR M&P set a precedent here by allowing "*The collection and archiving of all relevant data necessary for determining the baseline net greenhouse gas removals by sinks during the crediting period*" (paragraph 25b). It is also useful to note in this context that reference levels of base year emissions were not definitively known in 1997 when Annex I Parties agreed to quantified emission limitation or reductions objectives against this reference.

## *3. Alternative proposals*

### 3.1 Other proposals based on performance remuneration

A **carbon stock approach** is often mentioned with various interpretations. The common outline is that the baseline should relate to the remaining forest cover area or carbon stocks at the beginning of a period, so as to include all countries, irrespective of their past deforestation rates. Different carbon stock approaches have been suggested:

§ Prior et al. (2007) made a submission to the 26th SBSTA session proposing a carbon stock approach. Under this approach, a country would first estimate the carbon stock in the above-ground biomass of domestic forests and would receive an amount of non-tradable REDD credits corresponding to the reported value. The country would then differentiate between permanent forest reserves and common forestland that is subject to possible future deforestation. Only the avoidance of deforestation in common forestland would be eligible for trading, so that any private or public action to conserve common forestland give rise to tradable REDD credits. In other words, this proposal comes down to establishing a reference scenario of complete deforestation of common forestland over time. This approach also allows accounting for "force majeure" events.

- Gurney & Raymond (2008) proposed a "preservation pathway": under this approach, a country should determine the minimal forest quantity it wants to preserve and infer the deforestation rate evolution it has to follow.
- The Terrestrial Carbon Group (2008) estimated that in the following 50 years, the world's accessible forest may disappear. On that assumption it is possible to assess the annual deforestation rate that would lead to this complete deforestation for each country. Any emission reduction below this baseline would be creditable.
- A carbon stock approach was also echoed in the political sphere by B. Gardiner, who proposed to create a market that wouldn't pay for hypothetical avoided deforestation, but for real standing forests (Gardiner, 2008).

Under the **global baseline approach**, a global deforestation rate would be used as a reference point for all countries participating in the system. It consists in choosing an identical baseline for all countries, equal to the world deforestation rate (0.18% between 2000 and 2005, according to FRA 2005). Even if this approach is not chosen, a global baseline can be useful to help monitoring international leakage.

The **corridor approach** uses a target band as a baseline interval with a lower and an upper bound between which emissions are expected to lie, taking into account past emissions over an agreed historical period. If a country brings its emissions below the lower reference level, credits would be generated. For emissions within the "corridor", credits could accrue but not be eligible for sale until emissions fall below the lower boundary.

These approaches are compared in the Table 3 below. Karsenty and Pirard (2007) provide a detailed analysis of these options in French language.

### 3.2 Towards combined or differentiated baselines?

None of the above-mentioned proposals are perfect, but combining them could be a way of taking advantage of their respective assets. Strassburg (2008) suggested a baseline combining the historical approach and the global baseline approach. The avoided emissions eligible for REDD funding would be calculated as in the formula on the right.

Avoided emissions =
α (EE under the historic scenario – AE)
+ (1- α) (EE under the global average - AE)

Where: EE = expected emissions
AE= annual emissions

The α parameter should be properly calibrated in order to establish the appropriate level of equity among countries. Some simulations were made in the Eliasch Review (2008). The appeal of this proposal is that it addresses international leakage and provides a basis for all types of countries to join in.

Instead of designing an approach that works for all countries, an alternative proposed by Mollicone et al. (2007) is to let countries choose the baseline approach that best fits their specific circumstances. Countries with historically low deforestation rates could opt for global baselines and countries with high deforestation rates from historical ones. But few Parties to the UNFCCC are in favour of differentiated baselines among countries.

Both proposals deal with the issue of participation of all countries at different stages in the forest transition process in order to reduce international leakage. However these would not address the risk of hot air linked to historical and global baselines.

### 3.3 Rewarding efforts instead of results?

The mere use of baselines has been recently questioned. For Gurney & Raymond (2008), baselines were the first method envisaged to assess the impact of REDD activities as a form of imitation of the energy sector. They argue that baselines would not fit intrinsic characteristics of land use changes, and that building « perfect baselines » is therefore not currently possible.

Combes Motel et al. (2008) echo this theory and propose to reward "*successful efforts*" instead of results, in order to avoid comparisons with speculative baselines. A distinction can be made between structural causes of deforestation (independent of government actions) and causes directly related to failures of domestic policies and measures. They calibrate an econometric model on a panel deforestation data from a number of tropical countries at different time periods with structural causes as explanatory variables. The difference between observed deforestation and predicted deforestation then constitutes an estimation of countries success in dealing with deforestation. This method is implemented ex-post, which means that all data are already available. Uncertainties are linked to the model specification, and not to the prediction of the evolution of variables.

Remunerating efforts instead of results does not fit with the annex to decision 2/CP 13, which recommends "*performance-based payments*", but if provides an approach to identify possible cases of incentives for no efforts.

· Table 3: Comparison of carbon stock, global baseline and corridor approaches

| | **Effectiveness** | **Efficiency** | **Equity** | **Feasibility** | **Credibility** |
|---|---|---|---|---|---|
| **Carbon stock approach** | (+) it limits the risk of international leakage by including all countries | (-) risk of hot air (Eliasch review, 2008) | (+) it is broadly inclusive | (+) relatively easy to implement, especially if it focuses on above ground biomass (Prior et al., 2007) | (-) negotiations for determining the baseline will be submitted to political pressures (Combes Motel et al., 2008) |
| **Global baseline approach** | (-) countries with really high deforestation rates are not encouraged to participate in the mechanism; short term effectiveness is then reduced<br>(-) risk of international leakage in these countries | (-) risk of hot air : low deforesting countries may receive REDD credits even if they have not taking actions to keep their carbon stock steady ("credits for no action" - Olander et al., 2006) | (+) low deforesting countries are rewarded for their protection efforts | (+) transparent and easy to implement | (-) it would be an arbitrary choice, not based on science |
| **Corridor approach** | (-)more difficult to assess international leakage | (+) reduction of hot air amounts (but no disappearance) : credits would be produced by real efforts, instead of inter-annual variability | (-) based on past emissions (but allows for negotiation that could lead to a higher involvement of low deforesting countries) | (-) complex because two sorts of credits are involved | (-) negotiations for determining the lower bound will be submitted to political pressures |

*Conclusions on baselines:*

- *Deforestation results from a complex interaction between direct and indirect multi-sectoral factors*
- *Most proposals focused on rewarding countries on the basis of an assessment of their results*
- *There is no completely satisfactory proposal, and a balance must be found between political acceptability and effectiveness at the global level.*

# B - Scope of the mechanism

One of the most debated issues under UNFCCC in recent years has been the scope of the agreed mechanism: should it be about deforestation only? Or should it encompass forest degradation as well (REDD)? What about forest restoration and forestation activities leading to enhanced carbon storage (REDD+)? This section addresses the scope of national REDD+ strategies, the scope of reporting, and then the scope of the incentive mechanism.

## *1. Scope of REDD+ policies*

### 1.1 Mainstreaming REDD+ into forest policies

REDD+ strategies ought to address a broad range of forest-based actions, as relevant according to national circumstances. This may basically include a review of forest-related legislation, governance enhancement and law enforcement, all of which involve costs in terms of fostering forest stakeholders' dialogue, capacity development and leading change.

Another major area of action is investments into the promotion of sustainable management of productive forests, including proper forest management planning, low impact harvesting techniques to reduce emissions from degradation and, wherever suitable, forest restoration works with a combination of planting trees and human-induced natural regeneration within degraded forest areas (Blazer and Robledo, 2007).

However difficult for forest administration and forest management professionals, successful REDD+ strategies must also look beyond the boundaries of forests and address cross-sector drivers of deforestation in the agriculture and energy sectors.

### 1.2 Mainstreaming REDD+ into regional development policies

There is ample statistical evidence that deforestation can often be explained by non-forest variables such as prices of agriculture commodities, land tenure systems, infrastructure development, etc. (Combes-Motel, 2008, Geist and Lambin, 2004). Wherever such factors prevail, mainstreaming REDD+ into rural development strategies is the key to successful REDD+ strategies; and this relationship goes both ways: enforcing forest protection with no consideration for poverty alleviation would not lead to desirable outcome for the community either.

Centralised control of public forestland, whether the land is legally protected or not, whether the land is actually forested or not, is in certain situations increasingly considered untenable (Chomitz, 2006). Reforming tenure systems by means of privatisation or decentralisation may then be a prerequisite for the effective conservation of standing forests.

The intensification of agriculture practices has ambiguous effects on deforestation: a smaller area of land is needed to yield an equal crop output or household revenue, but the profitability gap between non-forest and forest land use may be expanded, which may indirectly lead to further agriculture expansion. Serious consideration should be given to all consequences wherever such approaches are envisaged, taking into account findings of Angelsen and Kaimowitz (2001), also cited in CIFOR (2007).

While the sustainable development of agriculture production is in the interest of both local socio-economic development and the global food balance, one of the most important success factors of the global REDD+ policy is that the elaboration of national/subnational public policies for agriculture development are based on a thorough understanding any impact on forest deforestation.

### 1.3 REDD+ as a way to promote access to energy

In most countries, the REDD+ core players (forest administrations, forest management organisations and forest research institutes) will have a decent understanding of the issues of the wood processing industry because this is where the economics of the sector are determined. Wood energy markets are generally much less well understood since wood energy stumpage prices for energy are low or nil.

Nevertheless, high deforestation/degradation rates are sometimes related to the massive and inefficient consumption of wood products for energy use, in absence of affordable alternatives for households. In such cases, there cannot be any proper answer to the REDD+ challenges unless the issue of access to sustainable energy sources is addressed. The R-PIN submitted by Ethiopia to the FCPF provides a positive example. This model of reaching out beyond the usual focus of national forest policies should be more widely followed.

## 2. *Scope of REDD+ monitoring, reporting and verification*

1996 IPCC GL, as complemented by IPCC GPG LULUCF, are used for the purpose of reporting under the requirements of UNFCCC. It proposes a land-based approach that creates the following reporting categories. 2006 IPCC GL retains these categories (Figure 3). 2006 IPCC GL Table 3.1 also proposes indicative stratification criteria to subdivide land representation (Figure 2).

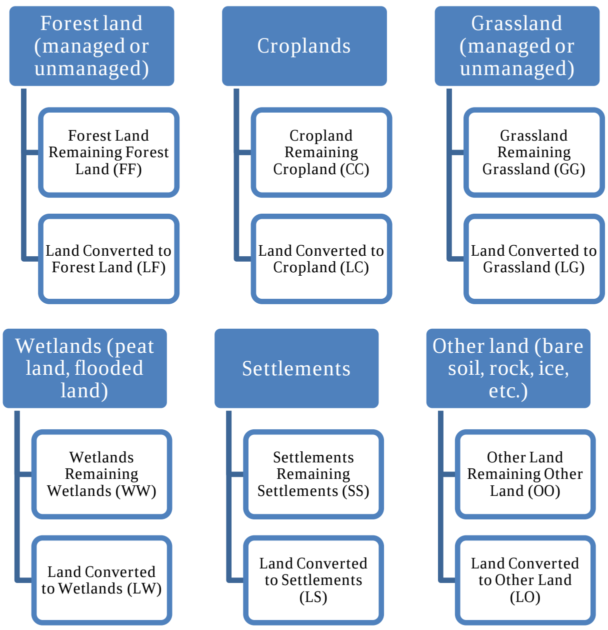


Figure 3: 2006 IPCC GL land use categories

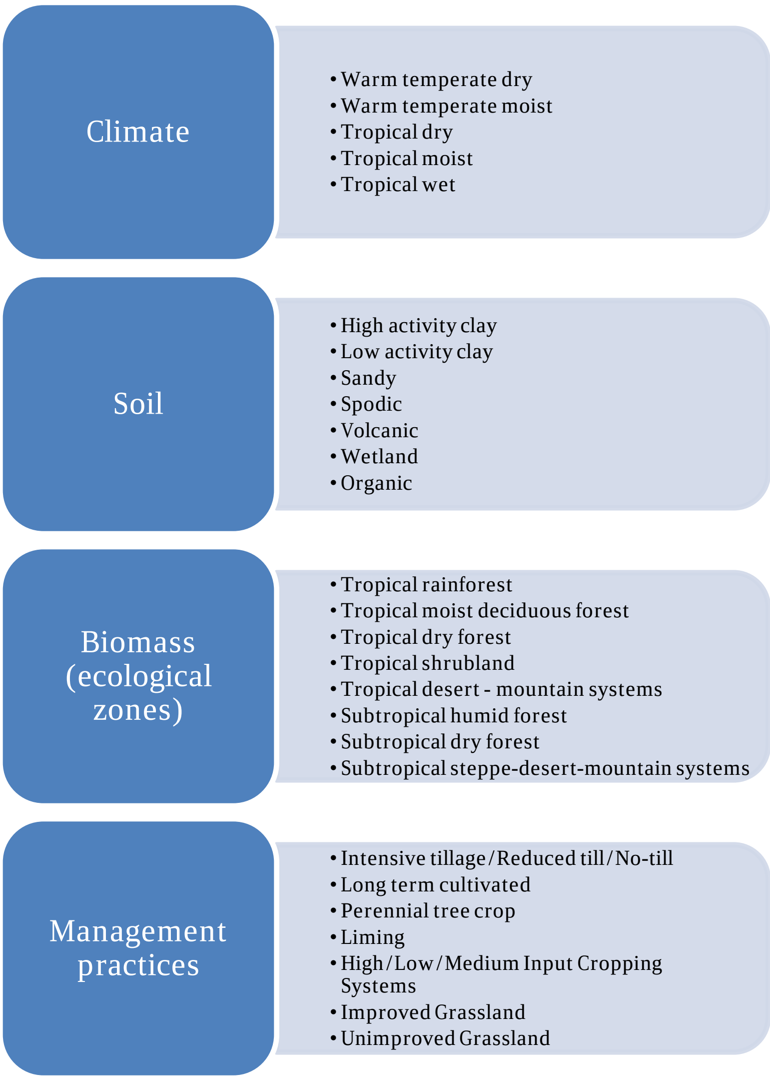


Figure 2: Indicative land stratification approach from 2006 IPCC GL

2006 IPCC GL also details 3 approaches for consistently representing land areas: (i) *Total land use area with no data on conversions between land uses*, or (ii) *Total land use area, including changes between categories*, or (iii) *Spatially-explicit land use conversion data*. Pending on the approach used, categories and strata can then be matched more or less precisely with factors to estimate GHG emissions/removals.

Kyoto Protocol introduced an activity-based reporting system with the intention to separate out non human induced effects. Areas subject to land uses changes since 1990 are considered in Article 3.3 (afforestation, reforestation, deforestation) and areas subject to other activities since 1990 that do not land use change in Article 3.3. Unmanaged forestland and grassland are not covered.

IPCC GPG LULUCF Chapter 4 proposes approaches for cross-referencing UNFCCC reporting and Kyoto Protocol reporting. At the time of writing this, it remains unclear whether the activity-based approach of Kyoto Protocol will be retained for the second commitment period, or if Parties will consider reverting back to the UNFCCC reporting format with some other ways to factor out the legacy of past management practices and non-direct anthropogenic effects on carbon storage, e.g. with a reference period in the recent past or with a forward-looking projection of structural effects.

Reporting for REDD+ might then derive either from Kyoto Protocol approach, or from the UNFCCC reporting format (Table 4).

· Table 4: Relation between REDD+ components and 2006 IPCC GL categories and Kyoto Protocol activities

| Corresponding IPCC GL category | REDD+ activity | Corresponding KP activity |
|---|---|---|
| ***Activity-based*** | | |
| Part of LC, LG, LW, LS, LO that: (i) are converted from forest, and (ii) are direct human induced | **Deforestation** | Deforestation under Art. 3.3 |
| Part of FF with managed forests only | **Conservation, reduced emissions from degradation, sustainable forest management, enhancement of forest carbon stocks through forest restoration**<br>ð ***Variant 1: broadly defined activity*** | Forest management under Art. 3.4 |
| Part of FF with only areas subject to the narrowly-defined activities | ð ***Variant 2: narrowly defined practices*** | Parts of forest management under Art. 3.4 with only areas subject to the narrowly-defined activities |
| Part of LF that is direct human induced | **Enhancement of forest carbon stocks through forestation** | Afforestation/reforestation under Art. 3.3 |
| ***Land-based approach*** | | |
| Part of LC, LG, LW, LS, LO that are converted from forest | **Deforestation** | Deforestation under Art. 3.3 + possibly some non directly human induced deforestation |
| FF | **Conservation, reduced emissions from degradation, sustainable forest management, enhancement of forest carbon stocks through forest restoration** | Forest management under Art. 3.4 + possibly some unmanaged forests |
| LF | **Enhancement of forest carbon stocks through forestation** | Afforestation / reforestation under Art. 3.3 + possibly some non directly human induced forest expansion |

Table 4 shows that the list of components of REDD+, as listed in the Bali REDD roadmap, is not operative in terms of designing an exhaustive and non-overlapping accounting system. 3 alternative accounting systems are presented:

§ **Activity-based accounting with a broad definition of forest management** relates to the accounting framework of Kyoto Protocol as further specified by Marrakech Accords. Parties may decide to keep using it as-is for Annex 1 countries over the second commitment period of Kyoto Protocol. They could also decide to amend the forest management definition so as to make it inclusive of the overall degradation in national forests that are not sustainably managed (which sounds like a tautology).

- **Activity-based accounting with narrow definitions of practices** relates to an alternative understanding of the accounting framework of Kyoto Protocol that was considered but not retained in the elaboration of Marrakech Accords. This framework would be most consistent with the understanding that degradation is a locally persistent decline in carbon stocks.
- **Land-based accounting** relates to IPCC Guidelines that are used for the purposes of reporting to the UNFCCC but was rejected at COP3 for the purposes of Kyoto Protocol. Parties could decide to revive this framework for the second commitment period, including for Annex 1 Parties. However, there has been no suggestion that REDD+ should extend to grassland, cropland or other non-forest land uses – except in cases where forestland is converted to such land uses, i.e. deforestation.

## 3. Scope of REDD+ incentive mechanism

International support for REDD+ actions in developing countries should take various forms to accommodate different national circumstances and needs in terms of type of activity, scale of action, type of initiator – governmental or not –, etc. As detailed in section D -2, there is an important role in that respect for project-based action supported voluntary carbon markets and by conventional means of ODA and international ENGOs, and for sectoral cooperation with multilateral and bilateral aid agencies.

A REDD+ overall incentive mechanism based on monitored emissions/removals over an agreed ambitious reference is a particular form of support that has special relevance to UNFCCC deliberations, although it is probably not the most important to trigger for action on the short run.

The perimeter of accounting could be national or a subnational administrative division, but it should not be a series of discrete units of land as in A/R CDM project activities. Within the geographical limits, all forests would be considered, including optionally newly established forests. Carbon stock losses in deforested areas would be considered as well.

Contrary to Marrakech Accords rules for Annex 1 countries, consideration could be given to allowing disregarding secondary carbon pools and/or non-$CO_2$ greenhouse gases from monitoring and accounting to some extent, while ensuring that major GHG emissions sources such as soil carbon release from peatland fires are not disregarded. Also contrary to Marrakech Accords rules, deforested areas could be ignored from accounting in subsequent periods if carbon losses have been fully accounting for.

It has been noted by some observers, especially in the ENGO community, that comprehensive accounting approaches may allow countries to massively convert their native forest reserves into forest plantation estates, either in-situ or ex-situ, and incur no negative consequence despite the evident ecological damages. To this, it could be argued that a comprehensive REDD+ framework would constitute an improvement over the current situation with which only afforestation/reforestation may be accounting for in developing countries. While the long term effect may be more or less carbon-neutral, such a country would still incur a short term debit, unless it opts for a Tier-1 monitoring approach that disregards degradation. To cover for this possibility, it could be proposed that countries that adopt Tier-1 approach may account for gross deforestation only (‘D’), not net deforestation (‘A’, ‘R’ and ‘D’).

Another reason for reporting newly forested land separately is that the updating of the reference in subsequent periods should not apply to these land areas. Otherwise any expected long term removals due to forestation become part of the reference before any credit can be generated for it. To reflect CDM A/R rules for the crediting period, it could be agreed that A/R land merge into general forest land after 30 years.

Accounting rules would then need to clarify that:

- Under a land-based approach, forestland is divided into “LF” for all forests established after January 1st, 2008 (after Bali decisions) but less than 30 years ago, and “FF” for other forestland. Where total land cover interpretation is applied, this distinction can be consistently sustained over subsequent periods. Where sampling is used, discrepancies in the distinction between LF and FF can be tolerated so long as estimation methods ensure that the sum of the two terms would not be affected.
- Under an activity-based approach, deforested areas may be removed from “Kyoto land” after all losses of forest carbon stocks are debited, and forested areas may be transferred to Article 3.4/forest management after 30 years.

Baseline construction in subsequent periods would then be made separately for “LF reddland” and “FF reddland”. Rules would specify that the effect of age class structure would be embedded into the baseline for “FF reddland”, but not for “LF reddland”.

*Conclusions on scope*

- *REDD+ strategies should be broad: not only protecting forests but also addressing the key drivers of deforestation/degradation. Where relevant, REDD+ strategies should ideally be mainstreamed into agriculture and energy policies.*
- *National or subnational REDD+ reporting should follow relevant sections of IPCC Guidelines.*
- *International support should enable diverse approaches to REDD+ action. Input-based support is essential in the short run. Output-based support should be operational by 2012 for the most advanced countries that are willing to go that way. Modalities for that are to be devised in conjunction with the treatment of Annex 1 sinks for the second commitment period in order to promote consistency*

# C - Monitoring techniques

## 1. Technical overview

### 1.1 Deforestation assessment

Following UNFCCC Decision 11/CP.7, deforestation or forest clearance was defined as: "…*the direct, human-induced conversion of forested land to non-forested land*." The capacity to detect deforestation will be highly dependant on the forest definition adopted by countries, the resolution and frequency of available remote sensing data and the spatial characteristics of forest cover change processes (size of deforestation areas, distribution of deforestation, time scale and cloud cover).

Reporting and accounting results from an assessment of the difference between an initial forest carbon stock and the final carbon stock, pending on the final land cover/use category. The various land use/cover categories and forest types can be identified with remote sensing data. Those data have to be calibrated and controlled with field information. The accuracy depends upon the resolution of the remote sensing data (minimum mapping unit), the frequency and data interpretation (Eliasch review, 2008).

Through remote sensing data the forest cover extent can be analysed and delineated by visual scene to scene interpretation (easiest to implement) or through advanced digital approaches as multi-date image segmentation or digital classification techniques (Brown et al., 2007). The choice between theses techniques relates to financial resources, local knowledge, the availability of image processing software and time. In any case, methods must provide for repeatable estimation (Brown et al., 2007).

Deforestation rates can be estimated with medium resolution imagery either by a full spatial coverage of the country (wall-to-wall) that provide a consistent observation for historical deforestation (Herold and Johns, 2007) or by a representative sampling of the forest cover extent of a country, less expensive and suitable for on-going monitoring (Achard et al., 2002) or error assessments.

### 1.2 Degradation assessment

The suggested proto-definition from IPCC (2003) was "A direct, human-induced, long-term loss (persisting for X years or more) or at least Y% of forest carbon stocks [and forest values] since time T and not qualifying as deforestation." However the UNFCCC SBSTA workshop of October 2008 leads to reconsidering this in order to simply refer to a persistent decline in carbon stocks, with no need for parameters to qualify this.

The forest cover change induced by forest degradation is much more difficult to detect than deforestation. The estimation of GHG emissions requires information on the extent and the type of degradation.

Detection of forest degradation can be done by intense field work, but it is costly and time consuming. If degradation is characterized by gaps in the canopy, as induced by selective logging (legal and illegal), a combination of remote sensing satellite data and an appropriate data processing protocol (Brown et al., 2007), can be used. In Brazil, Asner et al. (2005) developed the Carnegie Landsat Analysis System, based on automatic analysis procedure of Landsat data. In Cameroun, Mertens and Lambin (1999) worked on an indirect method using distance to road, detected by mid-resolution satellite imagery. A similar work was developed in Congo by Laporte et al. (2007). Souza et al. (2005) worked on a specific index calculated on mid-resolution satellite data (NDFI) and verified it with good confidence with Ikonos images in Amazonia. Forest under degradation is rapidly changing and become more difficult to detect. A correct carbon emission assessment requires regular data acquisition (Souza et al. 2003).

If degradation is induced by fuel wood and charcoal collection, there are no gaps in canopy to detect. Secondary datasets such as village density and proximity of village are needed to evaluate the impacted area, unless the effect on the canopy cover is more intense. But this degradation has less impact on carbon stocks (Brown et al., 2007).

Finally, we can consider other ways to identify forest degradation at landscape level:

- The maintenance of a regular forest inventory protocol with a stratified network of temporary or permanent sample plots can lead to an estimation of an overall decrease or increase in forest carbon stocks (e.g. in India and in parts of Mexico and China)
- The repeated interpretation of aerial images or high resolution satellite images can lead to the identification of various grades of forest density in overharvested areas such as the vicinity of major cities that are mostly fuelled by charcoal. In association with stratified sample ground measurements to determine the average carbon storage for each grade of forest density, this can lead to an estimation of this sort of forest degradation.

### 1.3 Biomass and carbon stock assessment

Monitoring the extent of deforestation and forest degradation is a first step in the assessment of greenhouse gas emissions. The next step is to combine the area of each land use/cover change with the estimation of the carbon stock in the five terrestrial carbon pools over time (aboveground biomass, belowground biomass, dead biomass, litter biomass and soil organic carbon) (2006 IPCC GL, from Decision UNFCCC 11/CP.7) (Figure 4).

Aboveground biomass is generally the largest pool in tropical forests and the most affected by deforestation and degradation, thus its measurement is critical (Gibbs et al., 2007). Brown et al. (2007) described two methods to estimate carbon stock changes in each pools: (i) through changes in carbon stocks, or (ii) through increments and losses. The choice of either of these methods depends on the selected pool to monitor and on the IPCC tiers[3] quality sought for the inventories (Brown et al., 2007). The estimation of carbon stocks or carbon flows can be estimated accurately by intensive field measurement ranging from direct measurement by destructive harvesting to the measurements of tree height or Diameter at Breast Height (DBH) in combination with allometric relationships (Chave et al., 2005; Brown, 1997). Countries can also make use of data from recent forest management plan (Brown & Lugo, 1992) or use of default parameters obtain from i.a. 2006 IPCC GL. Field data collection is time consuming and expensive at a national level. Advanced remote sensing data with Lidar (Boudreau et al., 2008), airborne laser scanning (Naesset et al., 2008) or JERS-1 (Saatchi et al., 2007) could be combine with field measurements for calibration and extended to all similar land use/cover categories. Cost abatement and/or precision enhancement can be obtained through the use of a properly stratified sampling scheme, at subnational, national or regional level, and calibrated parameters by biome type (Boudreau et al., 2008). A detailed review of available methods is presented in Table 5.

Forest biomass and carbon stocks are changing according to forest type, so the uncertainty in the estimation of emission/absorption accounting can be reduced by stratification of the forest cover (Brown et al., 2007; 2006 IPCC GL, IPCC GPG LULUCF). Brown et al. (2007) presents the two stratification methods: (i) an upfront stratification using existing or updated land cover maps, and (ii) a continuous stratification based on a continuous carbon inventory. According to Brown (2002), the use of generalized allometric relationships stratified by broad forest types or ecological zones is highly effective for tropical forest, even in highly diverse regions.

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[3] IPCC GPG and GL AFOLU present three general approaches with an increasing quality of estimation of GHG emissions/removals: *Tier 1*/ uses ancillary data and default data from IPCC guidelines; *Tier 2*/ uses specific data from the country over the whole country ; and *Tier 3*/ uses specific data from the country, coming from actual inventories and repeated measurements of trees from permanent plots and/or calibrated process models.

· Table 5. Benefits and limitation of carbon stock assessment methods (adapted from Gibbs et al., 2007)

| Method | Description | Benefits | Limitations | Uncertainty |
|---|---|---|---|---|
| **Biome average** | Estimates of average forest carbon stocks for broad forest categories based on a variety of input data sources | Immediately available at no cost<br>Data refinement could increase accuracy<br>Globally consistent | Fairly generalized<br>Data sources not properly sampled to described large areas | High |
| **Forest inventory** | Relates ground-based measurement to allometric relationships | Generic equations avail-able<br>Method widely understood<br>Can be inexpensive | Expensive<br>Time Consuming<br>Generic equations not appropriate for all regions<br>Challenging to produce globally consistent results | Low |
| **Optical remote sensors** | Lansat<br>Aster<br>Alos<br>SPOT<br>MODIS<br>MERIS | Routinely collected<br>Freely available at global scale<br>Globally consistent | Limited availability to develop good models for tropical forest<br>Spectral indices saturates at relatively low C stocks<br>Can be technically chal-lenging | High |
| **VHR* remote sensors** | Aerial photography<br>Ikonos<br>QuickBird | Reduce time and cost of forest inventories<br>Reasonnable accuracy<br>Excellent ground control for deforestation baseline | Cover small areas (10.000 ha)<br>Expensive<br>Technically challenging<br>No allometric equation related to crown cover | Low<br>To<br>Medium |
| **Radar remote sensors** | ALOS PALSAR<br>ERS-1<br>JERS-1<br>Envisat | Generally free<br>Can be accurate for young or sparse forest | Less accurate in complex canopies of mature forest<br>Errors increase in moun-tainous area<br>Can be expensive<br>Technically challenging | Medium |
| **Laser remote sensors** | LiDAR<br>Estimation of the forest structure | Accurately estimates full spatial variability of forest carbon stocks<br>Potential for satellite sys-tem to estimate global forest carbon stocks | Airplane-mounted only<br>Require extensive field data for calibration<br>Expensive<br>Technically challenging | Low<br>To<br>Medium |

* VHR : Very High Resolution

## 1.4 Accuracy assessment

Any monitoring system for deforestation and forest degradation should integrate an independent accuracy assessment (Brown et al., 2007; Herold & Johns, 2007). Some methods are already available for validation of land cover maps derived from remote sensing data (Strahler et al., 2006; Wulder et al., 2006), but fewer methods have been developed and regularly used for land cover change maps validation; indeed some relevant experiments have been carried out (Lowell, 2001; Stehman et al., 2003). High quality samples are required to produce consistent accuracy assessment but quality data are only available after 2000 in many developing countries. So the Earth observation community recommends the approach of “best efforts” and “continuous improvement” (Herold & Johns, 2007).

# 2. Practical implementation, applicability and associated cost

## 2.1 Forest cover change

### § Remote Sensing

Remote sensing imagery for forest monitoring and carbon assessment can be classified in 4 categories:

i. **optical data**. Whereas they are widely used for land cover and land use mapping, they cannot yet be used to estimate carbon stocks of tropical forests with certainty;

ii. **very high resolution data**. They are collected over small areas but could be used for inaccessible areas or in a sampling scheme for land use and land cover mapping and carbon stocks estimation with low uncertainty;

iii. **microwave or radar data** can be used to quantify forest carbon stocks in relatively homogeneous or young forests, but the signal tends to saturate at fairly low biomass levels. The recent Japanese ALOS PALSAR satellite has the potential to improve estimates of carbon stocks across the tropics for degraded or young forests, but might be less useful for mature, biomass-rich forests; and,

iv. **Lidar data**, a promising technology for carbon assessment through direct measurement of forest height. This is too expensive at present but it may improve our capacity to measure carbon stocks from space sometime in the future after it is boarded on satellites.

Table 6 presents a list of relevant remote sensing data that can be used for spatial monitoring of deforestation and forest degradation and for carbon stock assessment. More details on available remote sensing data can be obtained in CEOS (2008). A review of the methodology used in Annex 1 countries shows that only a minority of country is using direct remote sensing data for GHG inventories; these are mainly countries that feature large land areas (Achard et al., 2008). Most Annex 1 countries are using derived product such as CORINE Land Cover. IPCC GPG LULUCF and 2006 IPCC GL, AFOLU section, provide tables of existing land cover datasets mostly at regional level. These global datasets are not well suited for accurate monitoring, given the resolution and the actualisation frequency, but frequent updates to this web-based information source may expand opportunities in the future (Achard et al., 2008). According the analyses of Hardcastle et al. (2008), many developing countries have already significant capacity in remote sensing, as Brazil, China, India, Malaysia and Mexico. But most of African countries lack remote sensing capacities (see Figure 4).

· Table 6. List of relevant remote sensing data for deforestation and degradation monitoring and carbon stock assessment process.

| Sensors | Type | Start | Spatial resolution | | Low res. | Size (km) | Revisit frequency (days) |
|---|---|---|---|---|---|---|---|
| | | | Multispectrale | Panchromatique | | | |
| **ALOS PALSAR** | Radar | 2006 | 10 to 20m | | 100m | 70<br>350 | |
| **CBERS 1** | VIS/IR | 2003 | 20m | 2.7m | 260m | 113<br>27 | 26<br>26 |
| **CBERS 2** | VIS/IR | 2007 | 20m | 2.7m | 260m | 113<br>27 | 26<br>26 |
| **DMC Imager** | VIS/IR | | 32m | - | - | 300*300 | 5 |
| **DMC-2 Imager** | VIS/IR | | 22m | - | - | 660*4100 | 1 |
| **Envisat** | VIS/IR | | 1000m | | | 100*100 | 35 |
| **Envisat** | radar | | | | | | |
| **ERS-2** | radar | | 30m | | | 100*100 | |
| **Formosat 2** | VIS | 2004 | 8m | 2m | - | 24*24<br>24*24 | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **GeoEye 1** | VIS | Fin 2008 | 1.65m | 0.41m | - | 15*15<br>15*15 | < 3<br>< 3 |
| **Ikonos** | VIS | 1999 | 3.2 - 4m | 0.82 - 1m | - | 11*11<br>11*11 | 140<br>140 |
| **IRS P6** | VIS/IR | 2003 | 23m | 5.8m | 188m | | 24<br>24 |
| **Kompsat 2** | | 2006 | 4m | 1m | - | 15*15<br>15*15 | 28<br>28 |
| **Landsat 5** | VIS/IR | 1985 | 30m | - | - | 173*180 | 16 |
| **Landsat 7** | VIS/IR | 1999 | 30m | 15m | - | 173*180<br>173*180 | 16<br>16 |
| **Lidar** | | | ≥ 0.75m | | 0.70*x altitude (meters)<br>300 - 2000 meters (altitude) | | |
| **MERIS** | VIS | | | | | | |
| **MODIS** | VIS | | | | | | |
| **Orbview 3** | VIS | 2003 | 4m | 1m | - | 8*8<br>8*8 | 3<br>3 |
| **Orbview 2** | VIS | | 1.1 km | - | - | | |
| **Quickbird** | VIS | 2001 | 2.4-2.8m | 0.61-0.72m | - | 15*15<br>15*15 | 8<br>8 |
| **Spot 4 (spot vegetation)** | VIS/IR | 1998 | 20m | 10m | -<br>1000m | 60*60 | 26 (5)*<br>Daily |
| **Spot 5 (spot vegetation)** | VIS/IR | 2002 | 10m | 2.5 - 5m | -<br>1000m | 60*60 | 26 (5)*<br>Daily |
| **Terra ASTER** | VIS/IR | | 15m | | | | |
| **Worldview 1** | | 2007 | - | 0.5m | - | 16*16 | 1.7 à 4.6 |
| **Worldview 2** | | Mi-2009 | 1.8m | 0.46m | - | 16*16 | 1.1 à 3.7 |

IR: Infrared; VIS: Visible; * revisit of nadir

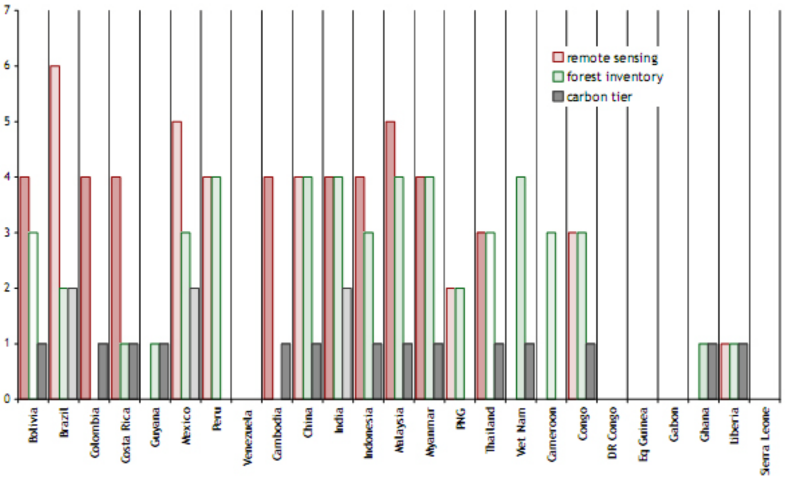


Figure 4. Capability assessment scores. Remote sensing scale: 0 – 6. Forest inventory scale: 0 – 4. Carbon tier: 0 – 3 (from Hardcastle et al., 2008).

§ **Synthetic cost estimation**

An estimation of resources required for a national forest monitoring system should include the acquisition of remote sensing data (Table 7), hardware and software for remote sensing data processing (more specific software is required for the treatment and analysis of radar imaging data), training, capacity building, data processing and analysis, field work and various steps of accuracy assessment (internal and independent external).

The cost estimation is highly dependent of existing data, national capacities, size and mapping area, availability of reference data, the comprehensiveness of the monitoring system, etc. (Herold & Johns, 2007). Based on existing national forest monitoring system as in Brazil and India, and some REDD case studies, Herold and Johns (2007) estimate a cost ranging from several hundred thousands to 2 million USD for an historical forest land cover map. Hardcastle et al. (2008) estimate the costs of setting up and running national forest emissions inventories (including the baseline) based on IPCC guidelines, for a reference country[4]. The costs were estimated to be in the order of 2 million USD in the first year and 0.7 million USD every year thereafter.

· Table 7. Cost estimation for remote sensing data acquisition.

| Sensors | Remote sensors | Cost** per km² |
|---|---|---|
| **Optical remote sensors** | Landsat, SPOT, IRS, DMC, MODIS, MERIS | Free up to 7.7 € |
| **VHR* remote sensors** | Aerial photography, Ikonos, QuickBird, | 2.1 € up to 35.0 € |
| **Radar remote sensors** | ALOS PALSAR<br>ERS-1<br>JERS SAR<br>Envisat | Free up to 16 € |
| **Laser remote sensors** | LiDAR | About 2000 € up to 4000 €<br>Price can vary depending on size of the project, point density and project location. |

* VHR: Very High Resolution

** All prices are indicative; indeed rates possibilities can vary widely, particularly for very high resolution images

## 2.2 Biomass assessment

In most tropical countries national or regional forest inventory data are available from past inventories for forest management purpose and from past scientific studies (Brown, 1997; FAO, 2005). Brown et al. (2007) define some criteria that these data should meet: (i) the data are less than 10 years old; (ii) the data are derived from multiple measurement plots; (iii) all species must be included in the inventories; (iv) DBH ³ 30cm or less and (v) the sample is representative of the stratum. According to the FAO database (FAO, 2005), 40% of the countries have a national forest assessment older than 10 years and 30% don't have national level data for carbon stock estimation. In case of incomplete national forest inventory, advanced methods have been proposed to extrapolate the data, based on GIS layers of soil, population, topography, land use and climate (Brown et al., 1993; Brown & Gaston, 1995; Inverson et al., 1994; Gaston et al., 1998).

Even if some data already exist, new field measurement will be needed, at least to achieve a Tier 2 or complete information on specific land category or strata. Regarding the cost of such activity, Brown et al. (2007) recommend to optimize new measurements to specific categories or strata that are exposed to higher risks of deforestation and forest degradation. Specific guidelines for carbon assessments of land use strata are provided by FAO (2004), IPCC GPG LULUCF chapter 4.3 and the World Bank Sourcebook for LULUCF (Pearson et al., 2005).

[4] For a medium size country with 50 million hectares of forest area, no forest inventory, no remote sensing capacity and where no data have been collected previously.

## 3. Case studies

### 3.1 Brazil

INPE (Brazilian National Space Agency) has developed and implemented a complementary set of forest monitoring systems:

- An annual deforestation monitoring system (wall-to-wall) called PRODES for the whole legal Amazon. The forest cover is obtain through a digital classification approach based on mid-resolution data (Landsat - 30m resolution), and annual assessments have been conducted since 1988.
- A monthly alert system for deforestation called DETER (Detecção de Desmatamento em Tempo Real), with low resolution data (MODIS and CBERS-2 data - 250m) to detect illegal logging since 2005. Image classification is produced with a combination of visual interpretation and linear mixture modelling.

### 3.2 India

The Forest Survey of India (FSI) conducts a biannual national forest monitoring system (wall to wall) based on mid-resolution data and a combination of visual interpretation and digital classification. Since 2000, data are produced at a scale of 23.5m, with a minimum mapping unit of 1 ha. The interpretation is complemented by intensive ground-truthing operations for about 6 months and the final accuracy assessment is carried out by an independent entity through a random sampling scheme verified on the ground or by very high resolution imagery.

### 3.3 Congo Basin countries

Deforestation and degradation in Central African countries are studied:

i. either by a complete forest monitoring in specific regions of interest (University of Maryland and University of South Dakota) for the CARPE programme;
ii. or at fine scale through a sampling scheme over the whole Congo Basin Forest (Catholic University of Louvain and European Commission Joint Research Center) for the FORAF programme.

4% of the whole Congo Basin Forest was digitally interpreted thanks to a regular grid of 10*10km windows of Landsat TM & ETM+ imagery.

### 3.4 French Guiana

A land use and land cover change inventory has been conducted for a first voluntary Kyoto inventory over French Guiana. Thanks to a SPOT/ENVISAT receiving station operated in Cayenne in the framework of the SEAS-Guiana project, a global cloudless SPOT mosaic has been produced for the year 2006. Almost 17,000 points were laid down on the SPOT mosaic with a stratified sampling design and individually photo-interpreted for 2006 and for 1990 on Landsat data. Land use and land cover change statistics have been calculated for the 1990-2006 period.

*Conclusions on monitoring*

- *A large range of methods are available to monitor emissions from deforestation and degradation in developing countries. Remote sensing technologies will improve over the next decades. Proper statistical operations and field data collection will remain essential.*
- *Existing IPCC guidelines propose appropriate tiered approaches for reporting and accounting emissions and removals of carbon dioxide. Those methods can be further elaborated to address tropical specificities, especially with regard to:*

1. *decision trees to interpret cases of deforestation in tropical environments, particularly concerning traditional farming systems of shifting cultivation with long fallow periods;*
2. *the use of radar imagery in cloudy tropical region (data availability and processing, management of uncertainty);*
3. *the integration of field observation and high definition remote sensing data for the identification of narrowly-defined activities (degradation) and stratification;*
4. *a more user-friendly presentation of guidance for stratification, sampling and sample plots design.*

# D - Financing

## 1. *Funding requirements*

Forecasting the cost and potential quantitative achievements of REDD+ activities is overwhelmingly challenging. However it is necessary to estimate the orders of magnitude as reliably as possible in order to facilitate on-going deliberations on the design of a REDD+ mechanism. The following table recalls some of the recently published estimates. It is useful to read these figures while bearing in mind that the global ODA to the forestry sector amounted to less than €600 million per year in 2000-2005 (OECD CRS 2006, cited in OECD, 2007c).

Table 1 : Information on REDD+ potential emission reductions and funding requirements

| Source[5] | Activity | Unit cost (€/t$CO_2$-eq)[6] | Emission reductions (Gt$CO_2$-eq/yr) | Funding requirement (billion €/yr) | Method/Comment |
|---|---|---|---|---|---|
| **IPCC SR LULUCF 2000** | Deforestation (20% abatement) | | 1,3 | | |
| **Loisel, 2001** | Forestation | | 0,22–0,48 | | Consideration of the potential scale of LULUCF activities in the CDM for the first commitment period |
| | Deforestation | | 0,22–0,77 | | |
| | Other activities | | 0,18–0,37 | | |
| **Grieg-Gran, IIED, (2006), Grieg-Gran, IIED (2006b)** | Deforestation (elimination in 8 selected countries) | 1.40 | 1.4 | 2 | Opportunity cost of foregone land uses. Selective logging not foregone. Assumes perfect information on pressures. Administrative costs involve an extra € 3-10/ha/yr, i.e. € 0.2-0.7 b after 10 years. |
| | | 2.40 | | 3.5 | Same as above, revenue from forest products also foregone. |
| | | 5.50–7.50 | | 8–11 | Same, supposing higher agriculture returns. |
| **Sohngen and Sedjo (2006), as cited in Trines (2007)** | Deforestation (elimination) | 20.00 | 278 cumulated | | Opportunity cost. GTM model |
| **Sathaye et al. (2007)** | Deforestation | 3.50 in 2010 up 5%/yr till 2050 | 0.7 | | Compensation for the opportunity cost corresponding to drivers relevant to each region. GCOMAP model. Transaction costs not considered. |
| | Deforestation | 7.00 in 2010 up 5%/yr till 2050 | 1,4 | | |
| | Deforestation (elimination in Africa) | 100.00 | | | |
| | Deforestation (elimination in Central America) | 330.00 | | | |
| | Deforestation (elimination in South America) | 380.00 | | | |
| | Deforestation (elimination in Asia) | 730.00 | | | |

5 Combined with author's computations to make figures comparable. Should some major sources have been missed, they will be added in a revised version of this paper.

6 Values reported in USD were converted in EUR using the exchange rate of September 10th, 2008: 1 EUR = USD 1.41. Figures are rounded to improve readability.

| | | | | | |
|---|---|---|---|---|---|
| **IPCC WGIII AR4** | All activities – Africa | Up to 15–35–70 respectively | 1.3–1.7–1.9 | Up to 19–60–137 | Based on three global forest sector models: GTM (Sohngen and Sedjo 2006), GCOMAP (Sathaye et al., 2007), and IIASA–DIMA (Benitez-Ponce et al. 2007) |
| | All activities – America | | 1.4–2.5–3.1 | Up to 20–89–223 | |
| | All activities – Asia | | 1.7–2.9–4.4 | Up to 25–101–314 | |
| | Forestation – all continents | | 1.2–2.0–2.8 | Up to 18–71–200 | |
| | Deforestation – all continents | | 2.1–3.2–3.8 | Up to 30–113–271 | |
| | SFM – all continents | | 1.1–1.9–2.9 | Up to 16–67–202 | |
| | All activities – all continents | | 4.5–7.1–9.5 | Up to 63–250–673 | |
| **Obersteiner et al. (2006)** | Deforestation (50% abatement by 2025) | 0.06–1.20 | 1.6 | 0.1–2 | Balancing net present value of forest and non-forest land uses with a spatially explicit biophysical and socio-economic land use model. Supposing perfect information on deforestation pressures. |
| | | 15.00 | | 24 | Same with payments targeted to high pressure zones |
| | | 85.00 | | 135 | Same with no information, no targeting |
| **Blaser & Robledo (2007)** | Deforestation (elimination by 2030) | 1.50 | 5,8 | 8.7 | Compensation of opportunity cost. |
| | Deforestation (65% abatement by 2030) | 2.00 | 3,8 | 7.4 | Compensation of opportunity cost and livelihood improvement. |
| | SFM / degradation | 0.85 | 6.6 | 5.7 | Optimization of forest ecosystems elastic capacity. Based on increased timber increment per region as estimated from silviculture experiences. |
| **Sathaye et al. (2007) as cited in UNFCCC 2007** | Deforestation (elimination) | 8.00–55.00 | 2.3 | 18–130 | |
| | Forestation | | 0.02–0.09 (??) | 0.6–5.5 till 2050 | Corresponds to 52 – 192 million ha planted by 2050. Establishment costs € 460 – 1120 per ha pending on site conditions, from ORNL (1995) |
| **UNFCCC (2007), based on ITTO and FAO FRA** | REDD (annihilation) | 1.50 | 5.8 | 9 | Compensation for the opportunity cost corresponding to drivers relevant to each region. |
| | Tropical SFM on production forests in developing countries | 1.00 | 5.4 | 5 | € 8.5/ha from ITTO expert panel (adjusted for inflation); extrapolation based on FAO FRA 2006 |
| | Temperate and boreal SFM on production forests in developing countries | 0.60 | 1.1 | 0,7 | € 14/ha from (Whiteman, 2006); extrapolation based on FAO FRA |
| | Forestation | | 0,04–0,11 in 2030 | 0.05–0.25 in 2030 | Area estimate from IPCC WGIII AR4 and establishment costs from ORNL (1995) |
| **Kindermann, et al. (2008)** | Deforestation (10% abatement) | 1.00–2.00 | 0.3–0.6 | 0.3–1.2 | Based on three economic models of global land-use and management |
| | Deforestation (50% abatement) | 7.00–8.50 | 1.5–2.7 | 12–20 | |
| **European Commission (EC, 2008)** | Deforestation (50% abatement by 2020) | | 1.5–2.7 | 15–25 | Based on Kindermann, et al. (2008), using 2005 exchange rates |
| | Deforestation (annihilation by 2030) | Below 70.00 | 3–5 | 30–75 | Extrapolated from the above |
| **Strassburg, et al (2008)** | Deforestation (95% abatement in top 20 forested developed countries) | 4.00 | 5.3 | 21 | |

§ **Deforestation, conservation**

Kindermann, et al. (2008) made the latest collective exercise involving the 3 main global land use models that were already used in IPCC WGIII AR4 and subsequently in other reviews including UNFCCC (2007). We therefore adopt their results as consensual within the community of experts on opportunity costs of avoiding deforestation. As an order of magnitude, a 50% abatement of deforestation would then cost around € 15 billion per year and yield 2 $GtCO_2$/yr of emission reductions, equivalent to 11% of total base year emissions of Parties indicated in Annex B of Kyoto Protocol.

In terms of timing, a decade would probably be required to ramp up REDD+ ground operations to the tune of 2 $GtCO_2$/yr. Therefore, only half of that estimate might be realistically achievable over the second commitment period, i.e. **1 $GtCO_2$/yr or 5.5% of Annex B Parties base year emissions**.

Grieg-Gran, IIED (2006) made a commendable attempt at assessing transaction costs of payment for environment services schemes (PES) and finds limited costs based on experiences from Mexico and Costa Rica. As large scale achievements are sought however, one will have to deal with less advanced tenure and farming systems and incur additional readiness, management and administration expenses. Results from Obersteiner et al. (2006) also highlight extra costs related to asymmetry of information. At the time when concrete national REDD plans are in the making, it remains challenging to quantify these overhead costs. We will set them globally at one third of the opportunity cost estimated above, bringing the total price tag to **€ 10 billion per year over the second commitment period**.

These values are derived while assuming the scenario that PES implementation will generally be adopted as REDD+ policy; it is important to note that many countries may not opt for different REDD+ strategies. Pending on specific opportunities and threats to the forest, actual action plans may include diverse activities such as land tenure reforms to promote private/municipal ownership, enhanced means of forest law enforcement, communication, training and subsidies for efficiency gains in traditional agriculture and the biomass energy supply chain, etc. Such strategies have different cost structures although it is not entirely clear whether the overall financial requirements would be higher or lower than with the PES compensation strategy. We therefore retain the above figures as our best possible estimate, bearing in mind:

- Uncertainties related to the estimation of opportunity costs (Pirard, 2008),
- That opportunity costs are a mere proxy for the actual costs of effective actions,
- That the actual cost of actions may be different from the "*procurement price*" to Annex I parties, pending on the agreed mechanism.

§ **Degradation, restoration, SFM**

Values for SFM are rather difficult to interpret in absence of clear differentiation between the short term and long term gains (avoided losses) in carbon stocks. Blaser & Robledo (2007) clarify that "*Through sustainable forest management, additional carbon sequestration can be reached, first through planned silvicultural management, based on optimization of yield and increase of faster growing, light demanding species. Forest restoration is another very important carbon sequestration strategy that could be addressed through forest management, but also through REDD. In addition forest management can reduce GHG emissions through reduced impact logging and other measures, including improvements in transport*." As MRV tools for are under development, reducing emissions from forest degradation increasing removals with restoration are likely to yield a smaller order of magnitude of GHG emission reductions than avoided deforestation in the short/medium term. While important for forests and climate change mitigation, it is fair to assume that the financial implications of positive incentives for these activities is well within the range of uncertainty on the cost of deforestation avoidance in the coming decade.

§ **Forestation**

A close look at values on forestation activities from Sathaye et al. (2007), IPCC WGIII AR4 and UNFCCC (2007) show that they are at best difficult to interpret because of the long time lag between forestation expenses and climate benefits. It is also unclear how forestation activities would be suitably incentivised under a reference and crediting scheme with periodic revisions of the agreed reference level: changes in the forest age class structures due to significant forestation actions would soon be captured into updated forward looking baselines while the bulk of the climate benefits from these activities would not have been reaped yet. Considering a positive incentive scheme in the form of an enhanced programmatic CDM in the second commitment period and referring back to the background note on the scale of CDM A/R produced for the EU LULUCF expert group in April 2001 (Loisel, 2001), we could expect the supply of credits from forestation activities in non-Annex 1 countries to reach 220-480 $MtCO_2$/yr over the second commitment period. The mid-range estimate is **350 $MtCO_2$/yr, or 2% of Annex B Parties base year emissions**.

As for REDD and SFM, funding requirements to achieve this depend on what sort of mechanism is put in place. If activities are financed on an incremental costs basis, as the GEF usually operates, experience from proposed forestation activities under the CDM suggest that the all-inclusive price tag could be about € 10/$tCO_2$, or € 3.5 billion in total. But it is unclear whether stakeholders would mobilise for prompt large scale action in absence of further incentives. Full market fungibility would likely multiply that price by a factor of 2 to 5 depending on where the GHG emission allowances price lands. Moderate market connection and positive incentives could bring the price up to **€ 15/$tCO_2$ (€ 5 billion in total)** while ensuring that sufficient incentives are in place to stimulate prompt action. Whether that is sufficient also depends very much on the evolution of timber and biomass markets.

## *2. Funding mechanisms*

There is a broad range of conceivable ways to raise funds for REDD+ activities and a number of commentators have discussed their respective advantages (UNFCCC, 2007, OECD, 2007, Dixon and Livengood, 2008). It is first useful to distinguish upfront funding requirements for readiness and sustainable development policies and measures on one side, and the purchase of credits for verifiable quantitative achievements over agreed ambitious reference levels on the other side, also taking into account that a combination of these approaches may be envisaged for different sets of countries and different time periods (CRFN, 2008).

Whether positive incentives are input-based or output-based, in both cases we can then distinguish bilateral, multilateral and private sources of funding. The following table provides some insight into all sorts of combinations that may be envisaged (Table 2).

All approaches have their own potential and limitations from the angle of poverty alleviation and ecological co-benefits, environmental and market integrity and cost/efficiency for consumers and tax payers at the end of the transaction chain. Many observers reckon that market-based instruments, whether that means private over public money or output over input-based funding, presents better prospects of sustaining the proper scale of funding over the long run. On the other hand Ian Fry's presentation on behalf of Tuvalu at the REDD+ workshop during Accra talks on climate change had an articulate 10 points argument on why market linkage should be avoided (CCPL, 2008). On balance, it seems that these approaches need to be somehow combined in order to meet the range of expectations of candidate countries for action on REDD+. Still, the Copenhagen COP/MOP will need to make painful decisions that will certainly leave no Party entirely satisfied.

· Table 2 : Envisaged approaches for financing REDD+ actions

| | Bilateral | Multilateral | Non-governmental |
|---|---|---|---|
| Input-based: Support readiness and PAMs | Bilateral ODA as concessional loans, technical assistance, grants or debt swaps | Existing multilateral ODA agencies or new REDD+ dedicated funding institution under the authority of UNFCCC COP/MOP | Project-based grants from conservation NGOs, private foundations, corporate sponsorship, etc. |
| Output-based: Procurement of REDD+ credits | Acquisition of REDD+ credits by Nations of UNFCCC Annex I to help meet deeper QELROs | Reverse auctions by a dedicated trust fund under UNFCCC; Shared procurement services by e.g. the World Bank for donor countries; Procurement by international industry trade groups on behalf on members companies. | Purchase of REDD+ credits by business organisations and individuals on a voluntary basis (often via brokers); or by industrial companies to help meet their obligations under domestic emission trading schemes |

Among the possible commitments in relation to REDD+ with implications on Annex I Parties Treasury, most decisions may be processed through ordinary ODA decision-making channels. Those that need be addressed specifically in the UNFCCC framework are: (i) any voluntary contributions to a new REDD+ dedicated instrument under UNFCCC, (ii) any share of proceeds on UNFCCC-related transactions and (iii) any mechanism to enable the use REDD+ credits to help meet extended Annex I parties QELROs.

## 3. Funding sources

Another general expectation is that the adopted funding scheme should raise the right amount of funds over extended periods **in a predictable manner**. As was discussed above however, the requirements are themselves next to impossible to predict at present. Any adopted market-based scheme to reward performance would require funds that depend both on volumes and price of REDD+ credits. Whatever the merits of REDD+ endeavours in acting countries, Finance Ministries of donor countries are not going to underwrite them if it creates liabilities of unpredictable scale on taxpayers' money. The certainty of financial implications for donor nations must therefore also be addressed when designing finance mechanisms.

As some Parties noted in the cross-cutting negotiation on finance, public funding capacities pale in front of the scale of funds required for climate-related activities such as REDD+. A number of innovative fund raising mechanisms have been studied (UNFCCC, 2007). It should be noted that UN bodies do not have the authority raise taxes in UN member countries; therefore any agreed levy on goods and services outside of UNFCCC-controlled transactions would practically take the form of pledges by donor countries to raise the tax by themselves and forward the proceeds to a dedicated trust fund. The democratic processes in these countries usually imply that such pledges cannot be made concerning periods of time extending beyond a few years.

· Table 3 : Categories of mechanisms based on the predictability of treasury or economic implications for donors[7]

| 1. Predictable at 10% | 2. Predictable at 50% | 3. Highly unpredictable |
|---|---|---|
| Voluntary pledges to a dedicated trust fund | Auction of a fraction of AAUs or ETS allowances | REDD+ crediting with full GHG market fungibility |
| Levies on predictable flows (GHG emissions, international aviation, maritime transport, GDP, population) denominated in own currency | Any levies/pledges denominated in foreign currencies | Guaranteed purchase of all REDD+ credits with a price floor |
| Price floor for AAUs with a stable basket of currencies | REDD+ crediting with dual market approach (volume capped by percentage of BY emissions and price capped by main GHG market price) | Agreed fund raising instruments whose rules and rates are not under sovereign control |
| | | Levies on marginal flows (use of Kyoto Protocol market mechanisms, activation of an agreed safety valve) |

In order to finance readiness and sustainable development policies and measures, it is recommended to adopt category 1-types of funding sources in order to generate sufficient predictability for both donors and REDD+ actors. Funding may evolve towards category 2 in consideration of better visibility on costs and volumes involved, i.e. after readiness activities have progressed in a number of REDD+ acting countries. That could mean REDD+ crediting with a dual market approach, as for CDM A/R under Kyoto Protocol 1st commitment period.

*Conclusions on funding*

® *REDD+ may yield 1.35 GtCO2-eq/yr over the second commitment period (equivalent to 7.5% of Annex B base year emissions) and cost € 15 billion.*

® *To make REDD+ work, bilateral, multilateral and non-governmental actors will all have to perform their duty in a complementary manner. Input-based and output-based funding will be both needed at different times and places.*

® *Any REDD+ mechanism adopted in Copenhagen will have to provide some certainty to donor countries on financial liability incurred. This may involve funding pledges for predictable amounts and limited REDD+ crediting.*

[7] Some category 3 schemes (broadening market fungibility and safety valve) would in fact tend to increase the predictability of the total cost of compliance but they reduce the predictability of positive incentives in other sectors.

# E - Scale

When speaking about scales, authors may either be referring to the scope of accounting and baseline construction, or to the scope of implementation of REDD activities (CIFOR et al, 2008).

## 1. Why are national baselines preferred?

· Table 8: Main arguments used to discriminate between national and project baselines

| | Some implications | Assets | Drawbacks |
|---|---|---|---|
| **Project baselines** | -Projects baselines would be constructed for individual projects (as in the CDM).<br>-There is no way of measuring the impact of national policies. Therefore project-based accounting does not provide effective incentive for government initiatives. This explains why project baselines are often connected to project activities. | -The amount of REDD credits delivered to REDD actors on the ground is relatively decoupled from external uncertainties on the success of other domestic activities. This improves the incentive structure. | -Risk of local leakage.<br>-Indirect deforestation causes won't be addressed unless national governments are involved through national baselines.<br>-More transaction costs because each project developer would have to determine his specific baseline.<br>-It is considered by some countries (Brazil) as a breach of national sovereignty. |
| **National baselines** | -Achievements would be measured against a national reference scenario and credits would only be generated if emissions are below a national reference level.<br>-Rewards would be made to national authorities. These authorities would be in charge of spreading REDD incentives around. Activities could be implemented both at national and subnational levels. Local activities wouldn't be impeded but governments would have to deliver incentives to local stakeholders for that. | -Local displacements of activities taken into account.<br>- Greater government involvement, which is important since most of deforestation causes are linked to public policies.<br>-Flexibility: authorities may choose the scope of activities they are going to implement in order to maximise efficiency in the context of national sustainable development policies.<br>-Economies of scale (less transaction costs). | -Enhanced capacities are required to elaborate credible national baselines in many cases.<br>-In countries with governance issues: risk of baseline manipulation, risk of elite capture of REDD revenues, low capacity to streamline incentives to direct deforestation agents.<br>-It could limit the participation of some countries with deforestation drivers that are difficult to control in the short term. |

The main concern leading to national baselines acceptance is the risk of local leakage. The issue of international leakage remains but it will decrease as more countries will join the system.

A range of national, subnational and project-level activities is required to address all deforestation causes. Forest-based activities are actually only dealing with local deforestation causes. Therefore in absence of national measures, this would likely lead to subnational displacement of activities and eventually to lower GHG emission reductions. On the other side, deforestation agents are acting locally because it's more profitable to cut down than maintaining forests. So if they are not directly targeted by financial incentives, they may not change their behaviours. The way national REDD credits are distributed through the different levels should depend on national specificities. In all cases, capture of benefits at national and local levels and conflicts arising from the increased value of land due to REDD could be major problems.

## 2. *Transitional vs. permanent subnational baselines*

Developing a national monitoring and accounting system may not be possible for all countries in the short term. As it was agreed in the Bali Roadmap (Decision 2/CP.13), subnational approaches can be examined as well. The conclusions of the REDD workshop at Accra Talks in August 2008 further specified that transitional subnational solutions may be a first step towards national accounting systems: "*Parties expressed the view that national approaches should be aimed for, whereas some recognized that subnational approaches could be a step towards these national approaches in order to address specific national conditions*" (UNFCCC, 2008). It appears in recent submissions from Parties that subnational approaches should be of limited length and that addressing subnational leakage should still be a necessity. Some Parties, especially Norway and New Zealand (UNFCCC, 2008) also consider that subnational transitional approaches may only lead to funding and not to REDD credits connected to carbon markets. These Parties are concerned about the risk of leakage and environmental integrity.

In their proposal, Streck et al. (2007) proposed a nested approach instead of this fund based transitional approach. Under the nested approach, accounting and crediting would occur at national and project levels. CDM-like project-based crediting would be allowed on the short term while a national approach is being developed. As national level accounting/monitoring system and emission reduction programs are progressively being developed, project activities could start independently and immediately to promote a quick start of REDD activities. The projects baseline should be established using approved methodologies[8]. Credits would be issued for emission reductions below the reference scenario minus project emissions minus leakage. Then, once a given percentage of the forested area of a country would be included in registered project activities, or after a given duration since the registration of the first project, the country would have to adopt a national target. The underlying assumption is that implementation of local activities will strengthen capacities in the country.

Streck et al. (2007) go even further: after the adoption of this national target, project baselines and activities should continue. They argue that the private sector wouldn't invest in REDD activities under a purely national approach because the risk of governmental failure is too high. REDD credits would be issued directly to the authorized project participants by the competent UNFCCC body, even in the case of excess deforestation emissions at the national level. Then these project emission reductions would be subtracted from national emission reductions in order to avoid double counting. And subnational leakage that can't be traced to particular project activities would be spotted through the national monitoring system.

This hybrid approach seems appealing as it solves some issues inherent to national and project approaches: it would favour both private investment and public policies, dealing with both direct and indirect deforestation causes. But three issues arise:

- providing direct incentives to REDD projects that are carved out of national REDD strategies could be considered as infringing on national sovereignty.
- it is unclear how it would fix the issue of leakage related to project baselines. Increases in GHG emissions observed at national level could be difficult to fairly attribute to leakage from individual projects.
- a methodological difficulty remains. Subtracting project-based emission reductions from national emission reductions may be inconsistent if national accounting are carried out using IPCC guidelines Tier 1 or Tier 2 methods, whereas project accounting use Tier 2 or Tier 3 methods.

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[8] At the moment, the only proposed methodology for REDD project baselines has been developed by the World Bank and is focusing on mosaic deforestation (Pedroni, 2008).

To conclude, while the nested-approach would facilitate early non-government action, concerns for permanence, leakage and feasibility arise. UNFCCC Parties may be unwilling to engage in the process of developing modalities and procedures for avoided deforestation under the CDM only for short term use. Voluntary carbon markets may be welcome to fill in this gap.

## 3. Solid area of land vs. archipelago of units of land

Under modalities and procedures for afforestation/reforestation activities under the CDM (CDM AR M&P paragraph 1b), "the project boundary geographically delineates the afforestation or reforestation project activity under the control of the project participants. The project activity may contain more than one discrete area of land".

This definition is built on the prerequisite that all units of land within the project boundary undergo eligible afforestation or reforestation activities under the control of project participants. This excludes areas of land that were already forested before, areas of land not under the control of project participants, and areas of land that are not effectively forested (e.g. firebreaks). As a consequence, the boundary of CDM A/R project activities generally looks like an archipelago of isolated polygons rather than a solid land area. This is increasingly the case now that the use of the mechanism is increasingly through programmes of activities rather than projects. CDM programmes of activities can also be transnational.

Defining boundary of accounting as an archipelago of units of land is best suited to ensure eligibility and secure attribution of certified emission reduction to legitimate actors (land owners or land use rights holders or their associates). However, this design is also very prone to leakage.

REDD+ differ from A/R in the sense that land eligibility is more inclusive and attribution derives from public authority prerogatives over forest/land use laws and policies rather than tenure. For these reasons, the boundaries of accounting can be made solid so as to reduce the risk of unaccounted activity displacement, whether the envisaged action is local, regional or national.

Relevant territorial authorities (local governments of municipalities, districts, State or national governments) should lead or be associated to REDD initiatives from NGOs in order to secure the legitimacy of attribution and, consequently, enable accounting over entire administrative areas.

As a matter of good practice, REDD perimeters are then defined along with administrative boundaries corresponding to the reach of effective territorial authority. This would mean that appropriate REDD perimeters can be whole municipalities instead of lists of discrete parcels; or whole administrative regions rather than lists of forest reserves. Any leakage effect on unprotected common or private forest land would then be accounted for.

Colombia and Mexico, both affected by domestic political conflicts, proposed to opt out somes areas that are not under effective government control. The underlying assumption is that a country shoud not be penalized for adverse external events (conflicts or extreme natural disasters, regarded as "force majeur" events). This possibility exists for Annex 1 countries, which do not include unmanaged forests in their reporting under Kyoto Protocol Article 3.4.

*Conclusion on scale*

- *UNFCCC negotiators tend to agree that the scope of REDD+ reference scenario, monitoring, reporting and accounting should be national.*
- *Local activities are not impeded by national accounting, and a range of different scales activities is necessary to address all deforestation causes.*
- *The debate lays on the period prior to the establishment of national targets: should project-based and/or subnational transitional baselines benefit from funds or REDD credits?*

# F - Permanence

## 1. Context

The risk of non-permanence is a unique feature that makes LULUCF activities different from mitigation actions in other sectors. At the heart of the problem lies the inherent reversibility of carbon storage in the biosphere, as a result of either natural causes (such as fires and pests) or human disturbances (such as land clearance).

The risk of non-permanence can be reduced through adequate design and implementation of projects, programmes or policies and measures, but it cannot be eliminated. Liability for residual risks must be allocated, not held by the atmosphere.

Whereas reversal of carbon sequestration in Annex I countries can be permanently monitored, reported and accounted for so long as commitment periods are contiguous[9], the risk of such reversals with CDM afforestation/reforestation activities in non Annex I countries required a specific set of liability rules, in accordance with the principle agreed in Marrakech Accords[10]. In effect, the host country is not quantitatively engaged under Kyoto Protocol and project participants do not necessarily have an appropriate legal status to bear liability for very long term reversal risks.

Reflecting the above-mentioned principle that was put forward by Brazil on behalf of the G77 principle at that time, the Colombian proposal was introduced in September 2000 and later taken up by the US during COP6 with a textual proposal included in brackets in the Mechanism negotiation text. Umbrella Group members acknowledge the advantages of the Colombian proposal, but also suggested that other (less stringent) schemes could be used.

Under the Colombian proposal, as sequestration/avoided release occurs and is certified, temporary credits are issued with a specified validity period. They can be used for compliance, banked or sold. Once retired for compliance, they expire after their validity period has elapsed and have to be replaced by cancelling other units. At project level, when an applicable time equal to the validity period has elapsed since issuance, new temporary credits can be issued if underlying benefits related to climate change continue to be maintained. Carbon stocks over baseline need to be monitored on a regular basis and projects participants are responsible for cancelling units if reversal occurs in the course of the applicable time.

In 2002 the EU suggested to shorten validity periods of temporary credits to 5 years (equivalent to one commitment period for annex I countries) and allow new temporary credits to be issued every five years after verification that the carbon remains stored. On top of these renewed credits, extra credits could be issued for newly sequestered CO2 tonnes. On the other end, the use of temporary credits postpones by five years the responsibility for offsetting GHG emissions. Practically, that means that an entity that uses a temporary credit for compliance is liable to provide a replacement unit 5 years after.

Both the Colombian proposal and the EU version of it were adopted in the Section K of the modalities and procedures for afforestation/reforestation activities under the CDM (CDM AR M&P), respectively under the names "*long term certified emission reductions (lCERs)*" and "*temporary certified emission reductions (tCERs)*". Market participants initially had a

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9 Annex to Decision 11/CP7, paragraph 19: "*Once land is accounted for under Article 3.3 and 3.4, all anthropogenic greenhouse gas emissions by sources from and removals by sinks on this land must be accounted for throughout subsequent and contiguous commitment periods.*"

10 Paragraph 1g of Decision 11/CP7: "*Reversal of any removal due to LULUCF activities be accounted for at the appropriate point in time.*"

preference for lCERs that looked more like regular CERs because of their longer validity period but nowadays markets participants prefer tCERs because their validity period, while shorter, is not uncertain. Locatelli and Gardette (2007) further explain the functioning and the economics of temporary crediting in French language.

Lately, in the context of reforming CDM modalities and procedures in order to make participation more geographically balanced, many experts identified the complexity of temporary crediting schemes as one of the barriers preventing a wider use of the mechanism. Administrators of domestic emission trading schemes such as the European Commission have also expressed concerns that including temporary credits would unnecessarily complicate these schemes.

Some of the approaches that were discarded for the treatment of permanence for CDM A/R are therefore being reconsidered. These approaches also matter for marketing voluntary forest-carbon offsets and in the context of the elaboration of policy approaches and positive incentives for REDD+. Fry (2008) recalls that any system that establishes a market approach to offset emissions needs to ensure that the offsets are permanent, otherwise there is no gain for addressing climate change. He notes that guaranteeing that reductions in emissions will be permanent is extremely difficult, although several accounting options are suggested, including *"selfinsurance, renewal or temporary crediting, sustained management and conservation of forests, banking carbon credits as a risk buffer, reducing future financial incentives to take account of deforestation emissions above the agreed level, banking credits and debits from one period to another, insurance buffers by withholding a proportion of REDD credits for sale and various modifications of the above*".

## 2. Other accounting approaches to deal with permanence

Beyond temporary crediting, this section briefly presents the following alternative approaches for permanence: risk management schemes (buffer, discount and portfolio approaches), the Danish deposit scheme, the ton-year accounting schemes and the covenants approach.

### 2.1 Risk management schemes

Risk management starts with the identification of the risks involved. Part of the risk can be internally managed through proper risk mitigation measures that are designed and implemented to improve the long-term safety of carbon storage. In that regard, a central role for local stakeholders is often useful to secure long term endorsement and support of local communities. This involves participation in project design and actual income generation for those dependent on the land. Residual risks may be managed through external measures with insurance policies, for which a market may be developing. Such an approach could include inter alia:

- *Buffers* or the application of a *discount factor* set aside part of the project verified removals to compensate for possible reversibility. Credit is only claimed for a certain percentage of the project offsets, possibly based on specific probabilities of various project types. The Voluntary Carbon Standard has refined this approach with a dedicated tool to assess project-specific buffering requirements (VCS, 2008).
- *A portfolio approach* spreads the risk on different projects in diverse settings (internal cross insurance). This is valid so long as some projects within the portfolio keep receiving extra credits for new removals to be used as collateral for the risks of mature projects.

Although risks are greatly reduced, the downside of these risk management approaches is that no entity is liable for the residual risks at portfolio or insurer's level. The recent financial crisis initiated by flawed risk assessment models underpinning bundles of subprime real estate loans illustrates this. In the case of non-permanence risks, the atmosphere would carry the ultimate risk.

Also, whereas trading in securities and insurance products requires proper licenses that guarantees financial viability against most contingencies, it remains to be seen whether the sort of entity that would trade in LULUCF risks would be subject to such oversight.

Moreover, insurance companies usually cover annual risks with annual fees; they do not take over any liability for contingencies that may eventuate decades after a contract. To illustrate this, let's say that a forestry estate acquires an insurance policy to cover wildfires risks. The estate manager will then pay an annual fee and, in case of adverse event during the year of insurance, the insurance company would compensate the estate for an amount equal to the decrease in the valuation of the discounted cash flows of future wood sales that won't happen as a consequence of the adverse event, even if those sales would have happened very far in the future. However if the adverse event occurs after the estate has terminated payments for the insurance fee, then the insurance policy does not apply.

## 2.2 Deposit scheme

The Danish proposal presented by Jesper Gundermann in June 2000 was essentially equivalent to the temporary credit scheme but buyers and sellers handle regular (non-temporary) credits (Gundermann, 2000). The central element is that the issuance of sink credits requires a deposit of an equal amount of future credits. In other words, if a sink project was to receive *x* credits in commitment period *n*, then, at the same time, *x* future credits must be deposited for the commitment period *n+1*. A future credit is a legal contract to deliver a unit of allowance or emission reduction at a future date. If the removal is maintained at the end of period *n+1*, then the deposit may be released and traded or used for compliance, provided it is again accompanied by a new deposit of a future credit for the next period *n+2*. In case of total or partial loss of the stored carbon, the loss will be compensated by the withdrawal of the deposit, which guarantees that emissions of a similar amount will be reduced somewhere in the world.

## 2.3 Ton-year-accounting scheme

The ton-year accounting scheme, as proposed e.g. by Bolivia in 2000, tried to establish an equivalence between removals of LULUCF projects and emission reductions of non-LULUCF projects (IPCC SR LULUCF, 2000, pp 85-89). Such an accounting system would award credits to LULUCF projects on the basis of both *how much* carbon benefit has been produced and *how long* this carbon benefit has been retained. Full credit is awarded to each tonne removed if that ton stays out of the atmosphere long enough to offset the effect of one ton of emissions. Partial credits can be awarded cumulatively over time.

The ton-year accounting system, depending on the type of system used, can quite stringently limit the number of credits involved on the short term, which then severely reduces the incentive to undertake projects. The accounting convention involves the arbitrary setting of the so-called "*equivalence time parameter*" (*Te*). The basic policy question that must be answered in this respect, is how long carbon must be sequestered to be considered equivalent to "permanent" emissions avoidance. Alternative methodologies have been proposed in literature to set this *Te*, ranging from 50 to over 150 years. Several different options exist to implement the ton-year-accounting system (Leining, 2000, Nieuwenhuis, 2000):

- Stock change crediting with ton-year liability: Full crediting of stock changes, capped at the expected level of long term storage. In case of sink reversal, credits must be surrendered for the unduly credited ton-years, based on the *Te* factor.
- Ton-year crediting: Crediting of realised ton-years of carbon storage based on the ton-year convention, i.e. crediting of the average carbon stock during the accounting period, times the duration of the accounting period, divided by *Te*.
- Equivalence-delayed full crediting: Full crediting of stock changes only after the storage has lasted for the equivalence time *Te*.
- Ex-ante ton-year crediting: Full crediting of expected ton-years based on the *Te* factor at the start of the project. Surrender credits based on the *Te* factor in case the storage does not occur or is reversed.

The main drawback of ton-year accounting schemes is that all the above options were either drastically reducing incentives (2 and 3) or not addressing the liability issue (1 and 4). It was also argued that the arbitrary 100-year equivalence, while necessary to compare the global warming potential of different greenhouse gases, is inappropriate for terrestrial storage vs. avoided emission of fossil carbon, because it comes down to ignoring the tail long term effects that may be opposite to the medium term effects.

### 2.4 Covenants

Some forest offsetting schemes linked to domestic emission trading schemes create alternative liability provisions for non-permanence that are based on persistent obligations to land owners to maintain forest cover or make up for any loss. This is enforced by way of covenant to the land titles, which ensures that any future land owner holds liability forward in case of non-permanence. Scheme administrators also have power under domestic jurisdiction to require the participants to purchase units from the market and to surrender them in order to make good the shortfall in carbon stocks. The New Zealand Permanent Forest Sink Initiative (MAF NZ, 2008) and the New South Wales Greenhouse Gas Abatement Scheme in Australia (GGAS, 2004) use this approach. This approach is best suited in countries with advanced land tenure and legal systems.

## *3. REDD+ crediting and permanence*

### 3.1 Is REDD subject to the risk of non-permanence?

Rubio and Kanounnikoff (Iddri, 2007) present both lines of thought: reducing emissions from deforestation and forest degradation may be conceptually equivalent to avoided fossil carbon emission (i.e. quasi-permanent), or to removals following forestation (i.e. possibly non-permanent).

Skutsch et al. (2006) discuss this issue and note that it can also be argued that reducing rates of deforestation operates conceptually similarly to reducing rates of exploitation of fossil fuels in the long run. They mention this argument but they fall short of endorsing it and they suggest that the choice for temporary credits may be seen as precautionary.

Experts may honestly disagree on whether permanence is an issue for REDD+ policy approaches, but we can safely affirm that deforestation is an irreversible act (hence the urgency of policy approaches), while avoiding it is a reversible decision (hence the need to worry about permanence).

The permanence of fossil carbon emissions – or the reduction thereof – is essentially a century-long view: one can assume that sparing a barrel of oil will leave it in geological reserves only so long as such reserves have not been nearly fully depleted. In other words, the simplified view is that if mankind makes a one-off effort to spare a barrel of oil today with all things remaining equal concerning future consumption patterns, then this barrel of oil will remain available after manking would after otherwise consume all that is left, possibly in a hundred years, and this barrel would be used the day after. Therefore, from the atmospheric point of view, sparing a barrel of oil is equivalent to postponing the corresponding GHG emissions by a more or less a hundred years.

In some cases, forest stock depletion is unfortunately a near term prospect; in those cases reducing emissions from deforestation and forest degradation is quite equivalent to postponing them by a few years. Such cases may relate to semiarid regions with mosaic farming systems, high demand for wood products from neighbouring urban centres, poverty traps and poor forest governance. The same applies to isolated forests on small islands or remote mountain regions with severe community pressures. In other cases, the forest area is so large that deforestation or degradation by new migrants could continue over many decades before any physical limits are reached. In such a situation, it is conceivable that REDD achievements are as persistent as fossil carbon emission reduction.

As noted by Skutsch et al. (2006), both initial RED proposals acknowledged the risk of reversal – the compensated reductions proposals from IPAM (Santilli et al., 2005) and the Joint Research Centre proposal (Achard et al., 2005).

UNFCCC negotiators have generally assumed ever since that permanence was an issue to be addressed in the context of REDD+, and rightly so.

### 3.2 Non-permanence and national-level forest sector action

Dutschke and Wolf (2007) noted that non-permanence only becomes a problem if a country that reduces its emissions from deforestation is not held liable for later re-emissions by increased deforestation and that a country may remain liable for forests preserved under a REDD scheme over a long-term timeframe. Robledo and Blaser's review for the UNDP (2008) stressed that the treatment of permanence is especially relevant if Parties agree on a market mechanism for REDD. The Compensated Reductions Proposals (Santilli et al., 2005) proposed addressing permanence by requiring participating countries that increase deforestation above their baseline to take the increment as a mandatory target in the subsequent commitment period. The JRC approach uses tCERs to deal with this problem.

The recent Communication of the European Commission noted that the same temporary crediting approach may be envisaged for financial incentives to reduce emissions from deforestation, be it project-based or national-based (EC, 2008). It noted also that the solution adopted for Annex I countries – liability ensured through the continuous accounting over time of the emissions and removals in national forest – can also be extended to the context of reducing emissions from deforestation and forest degradation in developing countries.

The EU submission to AWG LCA of October 2008 on REDD establishes that permanence is less of an issue where there is long-term responsibility for forest carbon stocks. The annex to this submission proposes specific mechanisms to address residual risks: buffering with ex-ante risk assessment, and carry-over for ex-post crediting risk assessment. This tends to indicate that tCERs would not be required with the mechanism to promote action in developing countries in the forest sector.

### 3.3 Non-permanence and project-level forest sector action

While comprehensive national reporting and accounting helps address the risk of non-permanence, the issue remains for the devolution of incentives to project-based activities under the umbrella of a national action plan. In effect, governments would not want to be left to carry the liability for failed projects while successful projects get their due credits.

The case for providing on-going small rewards instead of one-off full-value rewards relates also to the profile of revenue under the baseline scenario with deforestation. Deforestation is sometimes part of a private or community investment aimed at higher long term revenue from the land. In those cases, one-off payments may not be a suitable and effective compensation for foregoing the conversion of forestland to cropland or grazing land. Authorities who devise Payment for Environment Services schemes (PES) may then consider indexing them on cumulated REDD since a starting date rather than on REDD over successive monitoring periods. The unit value would of course be smaller but the long term incentives could be sounder, pending on specific circumstances. This approach is in fact equivalent to temporary crediting, with verification periods of possibly one year or less.

*Conclusion on permanence:*

- *Permanence is indeed an issue if the REDD+ credits are to be used to help meet the commitment of some other party.*
- *A REDD+ national crediting scheme under UNFCCC may not require temporary credits if REDD+ participants engage in subsequent national actions.*
- *Domestic incentive schemes for subnational or project-based activities under the umbrella of a REDD+ national action may still use accounting approaches to deal with permanence as required.*

# G - Implementation of national strategies

41 countries expressed their interest for the FCPF, but all did not yet apply officially by submitting an R-PIN. 18 notes were reviewed at the first section round in Paris in July 08, of which 14 were selected[11]. 10 new countries, as well as the 4 rejected at the first round, applied at the second selection round in Washington in October 08. The FCPF selected 11 countries[12], incrementing to 25 the number of participants REDD countries. This review is based on the analysis of the R-PIN of these 25 countries:

- Asia (5): Laos, Nepal, Vietnam, Papua New Guinea, Vanuatu;
- Africa (10): DRC, Gabon, Ghana, Kenya, Liberia, Madagascar, Cameroon, Rep. of Congo, Ethiopia, Uganda;
- Latin America (10): Bolivia, Costa Rica, Guyana, Mexico, Panama, Peru, Paraguay, Colombia, Argentina, Nicaragua

## 1. *Overview of the deforestation context in participant countries*

The combined analysis of the deforestation rate and forest area of each country gives us a good approximation of how far is has entered in the forest transition[13] process (see figure 1). 4 groups of countries appear:

§ **Countries with high forest area and low deforestation rate:**

These are countries which did not yet entered in the forest transition process (Gabon, Guyana, Rep. of Congo) or who holds big forest areas saved from deforestation up to date because of access difficulties or political instability (Colombia, Peru, DRC).

§ **Countries with high forest areas and high deforestation rate:**

There are countries which are at the beginning or in the heart of the forest transition process (Bolivia, Paraguay, Cameroon, Papua New Guinea, Argentina, Mexico)

§ **Countries with low forest area and high deforestation rate:**

These are:

- Countries whose forest area is naturally low (small size countries, small part of the country naturally covered by forests) which are at the beginning or in the heart of the transition process (Ethiopia, Nicaragua, Nepal);
- Countries heading towards the end of the forest transition process (Ghana, Liberia, Uganda)[14].

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[11] Bolivia, Costa Rica, Gabon, Ghana, Guyana, Kenya, Laos, Liberia, Madagascar, Mexico, Nepal, Panama, DRC, Vietnam

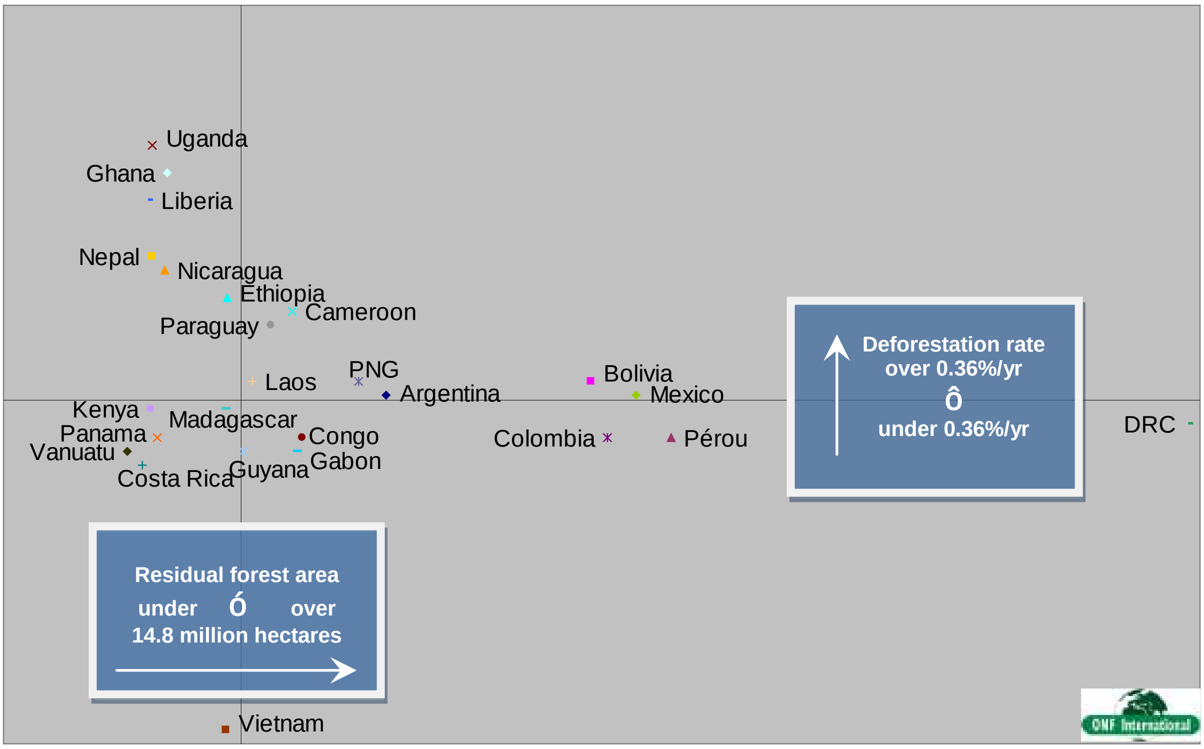
[12] Cameroon, Colombia, Ethiopia, Papua New Guinea, Paraguay and Peru were directly selected; Argentina, Nicaragua, Rep. of Congo, Uganda and Vanuatu were included as pending: they will participate providing that the FCPF succeeds in increasing the capitalization of the Readyness Fund; Central African Republic, Equatorial Guinea and Tanzania were not selected but may apply to the third round (march 09), during which 5 more countries will be selected (pending on the increase of the capitalization of the Readyness Fund).

[13] The "*forest transition*" notion should be understood as descriptive, not normative. Forest transition is precisely what REDD should be avoiding.

[14] We distinguished these two sub-cases looking at the % of country area covered by forest and country R-PIN

§ **Countries with low forest area and low deforestation rate:**

These are countries which are at the end of the forest transition process (Madagascar, Kenya), some of them recovering forest cover (Costa Rica, Vietnam). It was the intention of the FCPF to develop pilot analysis and experience on a variety of deforestation contexts, which is illustrated by the Figure 5.




· Figure 5: Country chart based on residual forest areas and deforestation rates. 0.36% is the average deforestation rate of UNFCCC non annex 1 countries over the period 2000-2005 ; 14.8 millions ha is the average forest area of UNFCCC non annex 1 countries in 2005 – Source : FAO FRA 2005.

· Table 9: Forest area, deforestation rate and % of country covered by forests. Source: FAO FRA 2005

| Country | Forest area in 2005 | Deforesta-tion rate 2000-2005 | Forest cover rate in 2005 |
|---|---|---|---|
| **Argentina** | 33,021 | 0.4% | 12.1% |
| **Bolivia** | 58,740 | 0.5% | 54.2% |
| **Cameroon** | 21,245 | 1.0% | 45.6% |
| **Colombia** | 60,728 | 0.1% | 58.5% |
| **Congo** | 22,471 | 0.1% | 65.8% |
| **Costa Rica** | 2,391 | -0.1% | 46.8% |
| **Ethiopia** | 13,000 | 1.1% | 11.9% |
| **Gabon** | 21,775 | 0% | 84.5% |
| **Ghana** | 5,517 | 2% | 24.2% |
| **Guyana** | 15,104 | 0% | 76.7% |

| Country | Forest area in 2005 | Deforesta-tion rate 2000-2005 | Forest cover rate in 2005 |
|---|---|---|---|
| **Madagascar** | 12,838 | 0.3% | 22.1% |
| **Mexico** | 64,238 | 0.4% | 33.7% |
| **Nepal** | 3,636 | 1.4% | 25.4% |
| **Nicaragua** | 5,189 | 1.3% | 42.7% |
| **Uganda** | 3,627 | 2.2% | 18.4% |
| **Panama** | 4,294 | 0.1% | 57.7% |
| **PNG** | 29,437 | 0.5% | 65.0% |
| **Paraguay** | 18,475 | 0.9% | 46.5% |
| **Peru** | 68,742 | 0.1% | 53.7% |
| **DRC** | 133,610 | 0.2% | 58.9% |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Kenya** | 3,522 | 0.3% | 6.2% | **Vanuatu** | 440 | 0.0% | 36.1% |
| **Laos** | 16,142 | 0.5% | 69.9% | **Vietnam** | 12,931 | -2.0% | 39.7% |
| **Liberia** | 3,154 | 1.8% | 32.7% | **Average** | **25,371** | **0.52%** | **43.6%** |

## 2. Proposed monitoring systems

The Forest Resources Assessment (FRA) carried out by the FAO (2000, 2005 & 2010 under preparation) is currently the only global forest cover monitoring system allowing comparisons over periods and countries. However, Table 9 below shows that FRA estimates differ substantially from national land use change data in many cases. This is due to differences in definitions and methods used in these assessments. In particular, FAO FRA reports net changes in national forest areas, i.e. deforestation minus forestation, whereas some national systems report gross deforestation.

The need to establish a reliable land cover monitoring system consistent with IPCC methodologies is therefore pointed out as a priority by all countries participating to the FCPF.

Central African countries consider establishing a standardized monitoring system steered at a regional level through the Central African Forests Observatory (OFAC).

· Table 10: Forest area, deforestation rate and % of country covered by forests. Source: FAO FRA 2005

| | **FAO FRA Deforestation 1990-2000** | | **FAO FRA Deforestation 2000-2005** | | **COUNTRY R-PIN data** | | | |
|---|---|---|---|---|---|---|---|---|
| | 1000 ha/yr | Annual rate | 1000 ha/yr | Annual rate | Period | 1000 ha/yr | Annual rate | Institution |
| **Colombia** | -48 | -0.1% | -47 | -0.1% | 1994-2001 | -101 | -0.18% | IDEAM |
| **Mexico** | -348 | -0.5% | -260 | -0.4% | 2002-2006 | -330 | | CONAFOR |
| **Argentina** | -149 | -0.4% | -150 | -0.4% | 1998-2002 | -235 | -0.82% | SayDS |
| **Gabon** | -10 | n.s. | -10 | n.s. | 1990-2000 | | -0.12% | OFAC |
| **Vietnam** | 236 | 2.3% | 241 | 2.0% | 2000-2005 | -6 | | MARD |
| **Paraguay** | -179 | -0.9% | -179 | -0.9% | 1990-2000 | -254.6 | | GLCF- Univ Maryland |
| **Bolivia** | -270 | -0.4% | -270 | -0.5% | 2001-2004 | -271 | | CI – WWF |
| **Cameroon** | -220 | -0.9% | -220 | -1.0% | 1990-2000 | -37 | -0.19% | OFAC |
| **Nicaragua** | -100 | -1.6% | -70 | -1.3% | 1983-2000 | -73 | -1.16% | |
| **Laos** | -78 | -0.5% | -78 | -0.5% | 1992-2002 | -134 | -0.6% | MAF |
| **Ghana** | -135 | -2.0% | -115 | -2.0% | 2000-2005 | -116 | -1.9% | |
| **Madagascar** | -67 | -0.5% | -37 | -0.3% | 2000-2005 | | -0.53% | Andriambolantsoa et al. 2007 |
| **Liberia** | -60 | -1.6% | -60 | -1.8% | 2000-2006 | | -0.35% | FDA, CI, SDSU |
| **Panama** | -7 | -0.2% | -3 | -0.1% | 1992-2000 | -41.25 | -1.12% | ANAM |

We note that deforestation rates mentioned in R-PINs are considerably higher in some places and lower in some others than FAO FRA values.

## 3. Proposed reference level

Most countries intend to use FCPF support in order to develop a reference scenario. Most consider developing a projected reference scenario, based on historical trends and adjustment factors/modelling of future trends. Few countries consider establishing a reference scenario based only on historic rates of deforestation.

## 4. Proposed policies and measures for REDD

Nearly all countries participating to the FCPF propose the same sets of policies and measures to address deforestation and forest degradation. We distinguish two forest based sets of policies and measures, forest conservation and sustainable forest management, and three non-forest based ones, rural livelihood improvement, control of large scale 42ffeccial agriculture and cattle ranching, and control of mining industries.

### 4.1 Forest-based policies and measures

§ **Forest conservation**

Countries wish to expand, reinforce and sustain their national, decentralized and private systems of protected areas. The main issue is to secure the funding of implementation costs over the long term. Theses policies may target the national administration in charge of protected areas, but also the decentralized administrations (provinces, regions, municipalities) when they established their own protected areas, and private owners, civil society organizations and NGOs engaged in conservation either through a partnership with the state either on their own.

§ **Sustainable forest management**

Countries wish to increase the value of standing forests (vs. other land uses such as agriculture and cattle ranching) while the sustainability of their environmental, social and economical services over the long term. This can be achieved through a set of policies and regulations such as establishing codes of practices (inventories, management plans, reduce impact logging), ensuring the traceability and legality of timber, guaranteeing a transparent process for the attribution of forest concessions. This considers also economical and fiscal incentives to the forest sector, improving the domestic forest industry efficiency, and promoting certification.

These policies primarily target the large scale commercial timber companies and export markets, under the scrutiny of international NGOs. Nevertheless, they may target as well the medium and small scale timber companies and the domestic markets.

### 4.2 Non-forest-based policies and measures

§ **Rural livelihood improvement**

Countries wish to address the deforestation caused by rural poverty through providing livelihoods alternatives to their poor rural populations. This includes targeting fuel wood consumption (energy efficiency, alternatives to fuel wood) and production (reforestation), promoting sustainable forest management and forest conversation at community level, providing alternatives to slash and burn agriculture (agro-forestry and practices that improve productivity) and extensive cattle ranching (sylvo-pastoralism), controlling forest and bush fires, and developing payments for environmental services schemas at household level. These policies target rural communities and households.

§ **Control of large scale commercial agriculture and cattle ranching**

Countries wish to prevent the uncontrolled conversion of forest lands to agriculture lands and pastures. This includes land use planning at national, regional and local levels, improving the capacity to monitor land use changes and enforcing laws and regulations such as forest conversion bans and mandatory social and environmental impact assessments prior to forest conversion. These policies target commercial farming and export markets.

§ **Control of mining industries**

Countries wish to prevent the uncontrolled conversion of forest lands to establish mining, gas and petroleum industries and the related infrastructure (roads, railways, dams). This includes land use planning and mandatory social and environmental impact assessments prior to forest conversion.

### 4.3 REDD+ strategies

A number of issues are cross-cutting to these policies and should be addressed across all sectors according to the countries. These are the capacities of state and decentralized administrations to monitor and enforce policies, laws and regulations, the clarification and securing of land tenure, and the establishment, monitoring and control of land use plans.

Any REDD strategy will be a combination of these policies and measures, specific to the country context: presence and magnitude of deforestation drivers, development agenda of the country, ability and political will to implement a specific policy. In many countries, the set of policies will vary from a region to another in order to take into account in-country variability, i.e. between Andean and Amazonian regions in Peru or Colombia, between dense forest and savannas regions in Cameroon or DRC.

It is stated in the objective of the UNFCCC Convention that the stabilization of greenhouse gas concentrations in the atmosphere shall be achieved within a time frame sufficient to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

This statement is particularly relevant in the case of REDD: not all deforestation is undesirable and converting low utility forests to other land uses providing higher and long-lasting sustainable benefits may be part of national development agendas. Kaimowitz *et al.* (1998) defined it as "appropriate deforestation" in opposition to "inappropriate" deforestation, that occurs when forest is converted at the expense of high forest values (biodiversity, large communities of forest dependent people) or in environmentally fragile areas. However, the perception of whether clearing a specific forest area is "appropriate" or "inappropriate" deforestation will differ according to the interests of various stakeholders. It is therefore crucial that REDD strategies are defined upon a detailed analysis of gains and losts from alternative land uses and within a proper stakeholders consultation framework.

The assets and drawbacks of the proposed policies may be assessed against several criteria:

- **Cost**, i.e. opportunity cost of the business as usual land use vs. expected revenue from the alternative land use, but also up front costs (investments, capacity building) and implementation costs (monitoring and enforcement);
- **Implementation**, i.e. how feasible is the implementation of the policy, looking at the national and international economical, social and political contexts; what are the associated risks?
- **Climate impact,** i.e. what is the potential of emissions reductions?
- **Additional benefits**, i.e. social and environmental (except carbon) impacts;
- **Monitoring**, i.e. what is the feasibility and what are the costs of monitoring, reporting and verifying the emissions reductions attributable to the policy?

It is the main purpose of the readiness fund to assist participant countries to conduct this type of trades offs analysis within each specific country context, and determine the most appropriate combination of policies that will form each country own REDD strategy.

## *5. Lessons from pilot REDD projects*

Few pilot projects are mentioned by the countries in their R-PINs:

- ***Madagascar*** is the most advanced country in this field with 3 ongoing pilot projects (Makira, biodiversity corridor between Mantadia, Analamazaotra and Maromiza, and FORECA). All target communities' involvement in the conservation and sustainable management of forest areas.
- In ***Bolivia***, the Noel Kempff Climate Action Project (NK-CAP) focuses on forest conservation and community sustainable development.
- In other countries, the development of pilot projects seems at an early stage, with starting initiatives in Ethiopia (Bale Mountain Ecoregion Emission Reduction Assets project), Peru and Guyana (Iwokrama forest).

Other sources of pilot experiences are the projects presented to the **CCBA**. There are about 40 proposed projects in there, inter alia:

- Avoided Deforestation in the Coffee Forest in El Salvador
- Avoided Deforestation through the Payment for Environmental Services in Rainforests located on Private Lands in the Conservation Area of the Central Volcanic Mountain Range of Costa Rica
- The Juma Sustainable Development Reserve Project: Reducing Greenhouse Gas Emissions from Deforestation in the State of Amazonas, Brazil
- Reducing Carbon Emissions from Deforestation in the Ulu Masen Ecosystem, Aceh, Indonesia

The **BioCarbonFund** also supports two projects with a REDD component:

- San Nicolás Agro-forestry project in Colombia
- Pico Bonito Forest Restoration project in Honduras

## 6. Articulation between national policies and local initiatives

The R-PINs submitted to the FCPF show a variety of contexts and challenges regarding the articulation of national policies and local initiatives.

While monitoring, reporting and accounting emissions reductions at a national scale is commonly agreed, most countries consider implementing activities at a sub-national level. Indeed, for countries where land use and forest/environment policies rely on decentralized entities (typical example is Argentina, a federal country), the actual implementation of any REDD strategy will rely on sub-national initiatives. In another scope, Madagascar offers a good example of a country experiencing several pilot initiatives at local level and the challenges of articulating these local actions with a national strategy and monitoring and accounting system.

*Conclusion on national REDD strategies:*

- *The R-PIN preparation and submission process is an efficient initiative that contributed to the development of a national participatory thinking on REDD in some countries;*
- *Numerous existing projects were revealed though the R-PINs preparation process. Reviewing lessons learnt from these projects can help in the development of improved national REDD strategies;*
- *Eligible countries shows a wide variety of circumstances regarding deforestation rates, deforestation drivers and potential REDD strategies.*

Central African countries offer a unique example of forest and environmental policies coordination at a regional level, through the Central African Forest Commission (COMIFAC). These countries underline that REDD should not happen at the expense of regional coordination and should be mainstreamed in policies coordination efforts of the COMIFAC.

It is expected that useful lessons will be drawn from these practical country cases through the preparation and implementation of their R-PLANs.

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