



Réduction des émissions liées à la déforestation et à la dégradation des forêts (REDD)

Examen de 7 points
d'achoppement pour la
prise en compte de REDD
dans la gouvernance inter-
nationale du climat

30 septembre 2008

Fiche « financement »

Cette fiche fait partie d'une série réalisée pour le compte du groupe de travail français sur les forêts tropicales et pour le groupe d'experts puits de l'Union européenne sous Présidence française, sur financement de l'**Agence française de développement**.

Funding REDD+

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.

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

Source ¹	Activity	Unit cost (€/tCO ₂ -eq) ²	Emission reductions (GtCO ₂ -eq/yr)	Funding requirement (billion €/yr)	Method/Comment
IPCC SR LULUCF 2000	Deforestation (20% abatement)		1.3 GtCO ₂ -eq/yr		
EU LULUCF EG 2001	Forestation		220-480 MtCO ₂ /yr		Consideration of the potential scale of LULUCF activities in the CDM for the first commitment period
	Deforestation		220-770 MtCO ₂ /yr		
	Other activities		180-370 MtCO ₂ /yr		
Grieg-Gran, IED, (2006), Grieg-Gran, IED (2006b)	Deforestation (elimination in 8 selected countries)	€ 1.40/tCO ₂ -eq	1.4 GtCO ₂ -eq/yr	€ 2 b/yr	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/tCO ₂ -eq		€ 3.5 b/yr	
		€ 5.50-7.50/tCO ₂ -eq		€ 8-11 b/yr	
Sohngen and Sedjo (2006), as cited in Trines (2007)	Deforestation (elimination)	€ 20.00/tCO ₂ -eq	278 GtCO ₂ -eq cumulated		Opportunity cost. GTM model
Sathaye et al. (2007)	Deforestation	€ 3.50/tCO ₂ -eq in 2010 up 5%/yr till 2050	0.7 GtCO ₂ -eq/yr		Compensation for the opportunity cost corresponding to drivers relevant to each region. GCOMAP model. Transaction costs not considered.
	Deforestation	€ 7.00/tCO ₂ -eq in 2010 up 5%/yr till 2050	1.4 GtCO ₂ -eq/yr		
	Deforestation (elimination in Africa)	€ 100.00/tCO ₂ -eq			
	Deforestation (elimination in Central America)	€ 330.00/tCO ₂ -eq			
	Deforestation (elimination in South America)	€ 380.00/tCO ₂ -eq			
IPCC WGIII AR4	All activities - Africa	Up to €15 - €35 - €70 /tCO ₂ -eq respectively	1.3-1.7-1.9 GtCO ₂ -eq/yr	Up to € 19-60-137 b/yr	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 GtCO ₂ -eq/yr	Up to € 20-89-223 b/yr	
	All activities - Asia	1.7-2.9-4.4 GtCO ₂ -eq/yr	Up to € 25-101-314 b/yr		
	Forestation - all continents	1.2-2.0-2.8 GtCO ₂ -eq/yr	Up to € 18-71-200 b/yr		
	Deforestation - all continents	2.1-3.2-3.8 GtCO ₂ -eq/yr	Up to € 30-113-271 b/yr		
	SFM - all continents	1.1-1.9-2.9 GtCO ₂ -eq/yr	Up to € 16-67-202 b/yr		
	All activities - all continents	4.5-7.1-9.5 GtCO ₂ -eq/yr	Up to € 63-250-673 b/yr		

¹ 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.

² 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.

Obersteiner et al. (2006)	Deforestation (50% abatement by 2025)	€ 0.06-1.20/tCO ₂ -eq	1.6 GtCO ₂ -eq/yr	€ 0.1-2 b/yr	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/tCO ₂ -eq		€ 24 b/yr	Same with payments targeted to high pressure zones
		€85.00/tCO ₂ -eq		€ 135 b/yr	Same with no information, no targeting
Blaser & Robledo (2007)	Deforestation (elimination by 2030)	€ 1.50/tCO ₂ -eq	5.8 GtCO ₂ -eq/yr	€ 8.7 b/yr	Compensation of opportunity cost.
	Deforestation (65% abatement by 2030)	€ 2.00/tCO ₂ -eq	3.8 GtCO ₂ -eq/yr	€ 7.4 b/yr	Compensation of opportunity cost and livelihood improvement.
	SFM / degradation	€ 0.85/tCO ₂ -eq	6.6 GtCO ₂ -eq/yr	€ 5.7 b/yr	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/tCO ₂ -eq	2.3 GtCO ₂ -eq/yr	€ 18 - 130 b/yr	Corresponds to 52 - 192 million ha planted by 2050. Establishment costs € 460 - 1120 per ha pending on site conditions, from DRNL (1995)
	Forestation		18 - 94 MtCO ₂ -eq/yr (??)	€ 0.6 - 5.5 b/yr till 2050	
UNFCCC (2007). based on ITTO and FAO FRA	REDD (annihilation)	€ 1.50/tCO ₂ -eq	5.8 GtCO ₂ -eq/yr	€ 9 b/yr	Compensation for the opportunity cost corresponding to drivers relevant to each region.
	Tropical SFM on production forests in developing countries	€ 1.00/tCO ₂ -eq	5.4 GtCO ₂ -eq/yr	€ 5 b/yr	€ 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/tCO ₂ -eq	1.1 GtCO ₂ -eq/yr	€ 0.7 b/yr	€ 14/ha from (Whiteman, 2006); extrapolation based on FAO FRA
	Forestation		43.5 - 108.7 MtCO ₂ -eq/yr in 2030	€ 0.05-0.25 b in 2030	Area estimate from IPCC WGIII AR4 and establishment costs from DRNL (1995)
Kindermann, et al. (2008)	Deforestation (10% abatement)	€ 1.00-2.00/tCO ₂ -eq	0.3-0.6 GtCO ₂ -eq/yr	€ 0.3-1.2 b/yr	Based on three economic models of global land-use and management
	Deforestation (50% abatement)	€ 7.00-8.50/tCO ₂ -eq	1.5-2.7 GtCO ₂ -eq/yr	€ 12-20 b/yr	
Strassburg, et al (2008)	Deforestation (95% abatement in top 20 forested developed countries)	€4.00/tCO ₂ -eq	5.3 GtCO ₂ -eq/yr	€ 21 b/yr	

▪ 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 GtCO₂/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 GtCO₂/yr. Therefore, only half of that estimate might be realistically achievable over the second commitment period, i.e. **1 GtCO₂/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.

- **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 by the EU LULUCF expert group in April 2001, we could expect the supply of credits from forestation activities in non-Annex I countries to reach 220-480 MtCO₂/yr over the second commitment period. The mid-range estimate is **350 MtCO₂/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/tCO₂, 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/tCO₂ (€ 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, MAF NZ, 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 : 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 of 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

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.

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.

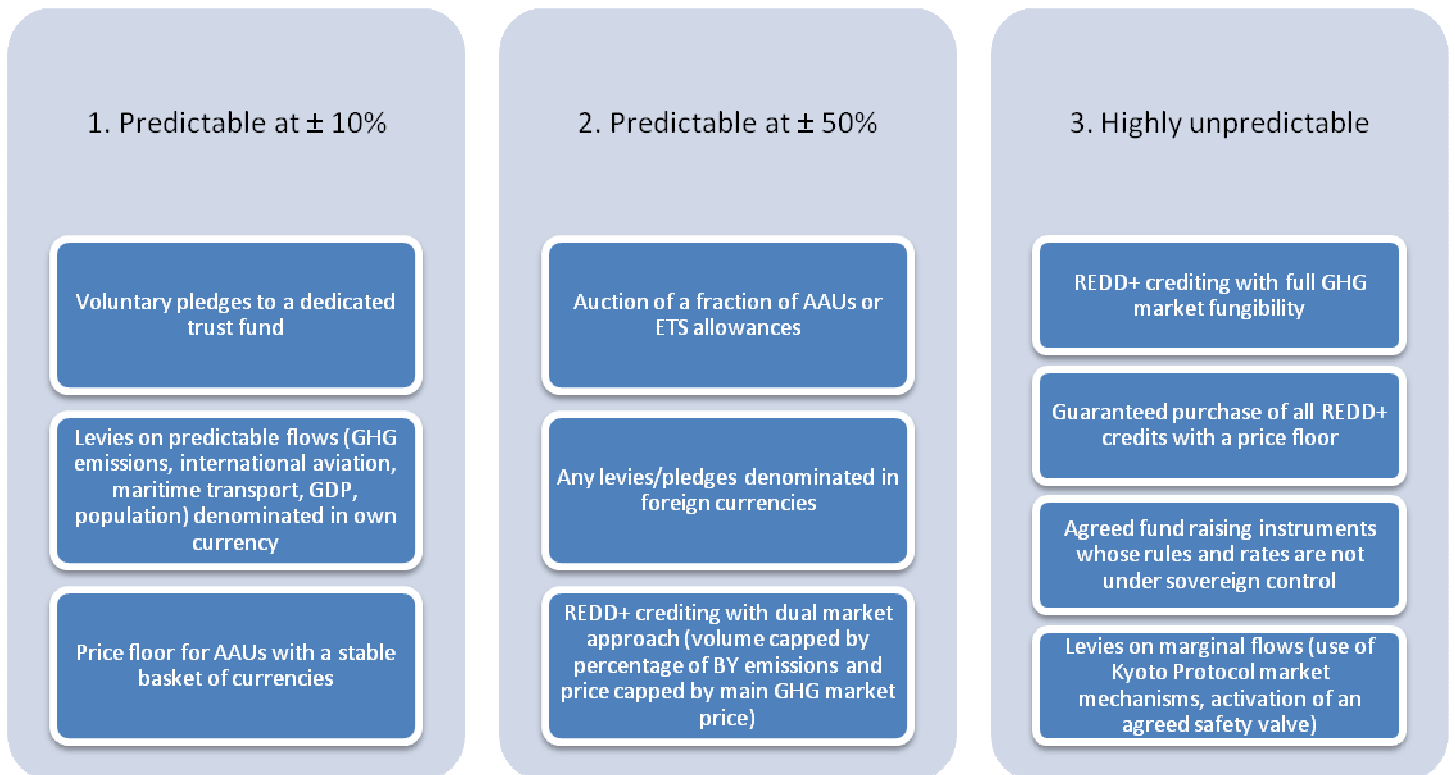
3. Funding sources

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 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 donors³



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.

4. *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.**

³ 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.

Sources for this section

Benítez-Ponce et al., 2007	Benítez-Ponce, P.C., I. McCallum, M. Obersteiner, and Y. Yamagata. 2007: Global potential for carbon sequestration: geographical distribution, country risk and policy implications. <i>Ecological Economics</i> , 60, pp. 572-583
Blaser & Robledo, 2007	Initial analysis on the mitigation potential in the forestry sector. Prepared for the UNFCCC Secretariat. Intercooperation, Bern. 1 August 2007.
CCPL, 2008	Presentation of the Government of Tuvalu in collaboration with the Centre for Climate Policy and Law, Australian National University. Accra Talks on Climate Change, 22 August 2008
CRFN, 2008	Presentation of the Government of Papua New Guinea on behalf of the Coalition of Rainforest Nations. Accra Talks on Climate Change, 22 August 2008
EU LULUCF EG, 2001	Background note on the scale of sinks in the CDM. Internal analysis of the EU LULUCF expert group, April 2001.
FAO, 2005	Forest resource assessment.
Grieg-Gran, IIED, 2006	The Cost of Avoiding Deforestation. Report prepared for the Stern Review of the Economics of Climate Change. October 2006. London: IIED.
Grieg-Gran, IIED, 2006b	Is tackling deforestation a cost-effective mitigation approach?
IPCC SR LULUCF 2000	IPCC Special Report on Land Use, Land-Use Change And Forestry, 2000. Robert T. Watson, Ian R. Noble, Bert Bolin, N. H. Ravindranath, David J. Verardo and David J. Dokken (Eds.). Cambridge University Press, UK, pp 375.
IPCC WGIII AR4 (Chapter 9)	Nabuurs, G.J., D. Masera, K. Andrasko, P. Benítez-Ponce, R. Boer, M. Dutschke, E. Elsidig, J. Ford-Robertson, P. Frumhoff, T. Karjalainen, O. Krankina, W.A. Kurz, M. Matsumoto, W. Oyantcabal, N.H. Ravindranath, M.J. Sanz Sanchez, X. Zhang, 2007: Forestry. In <i>Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change</i> , Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
Kindermann et al., 2008	Kindermann, Obersteiner, Sohngen, Sathaye, Andrasko, Rametsteiner, et al. (2008). Global cost estimates of reducing carbon emissions through avoided deforestation.
MAF NZ, 2008	Dixon & Livngood. Review and Assessment of Options for Reducing Emissions from Deforestation in Developing Countries. New Zealand Ministry of Agriculture and Forestry. Report prepared by M-co Consulting in association with GHG Offset Services with input from Arild Angelsen and Bernhard Schlamadinger
Obersteiner et al., 2006	Rametsteiner, Obersteiner, Kindermann, & Sohngen. Economics of Avoiding Deforestation.
OECD, 2007	Karousakis, & Corfee-Morlot. Financing Mechanisms to Reduce Emissions from Deforestation: Issues in Design and Implementation. OECD.
ORNL, 1995	Cited in UNFCCC (2007)
Sathaye et al., 2007	Jayant Sathaye, Willy Makundi, Larry Dale, Peter Chan and Kenneth Andrasko. GHG Mitigation Potential, Costs and Benefits in Global Forests: A Dynamic Partial Equilibrium Approach. <i>Energy Journal</i> , Special Issue 3, pp. 127-172.
Stern N et al., 2006	Stern Review Report: The Economics of Climate Change. London, UK: Her Majesty's Treasury.
Strassburg, 2008	Strassburg, B., et al, 2008. An Empirically-Derived Mechanism of Combined Incentives to Reduce Emissions from Deforestation. Centre for Social and Economic Research on the Global Environment (CSERGE), Norwich.
Trines E., 2007	Final report on investment flows and finance scheme in the forestry sector with particular reference to developing countries needs: A report for the secretariat of the UNFCCC. 2007
UNFCCC, 2007	United Nations Framework Convention on Climate Change. Investment and financial flows to address climate change.
Whiteman, 2006	Cited in UNFCCC (2007)