Building Forest Carbon Projects

Business Guidance

FOREST TRENDS

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2011

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Forest Carbon Marketing and Finance

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Forest Trends analyzes strategic market and policy issues, catalyzes connections between producers, communities and investors, and develops new financial tools to help markets work for conservation and people.

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The **Katoomba Incubator** provides comprehensive support to bring promising ecosystem services projects to the point where they can access markets or other sustainable finance. The Incubator focuses primarily on communities and small to medium landowners, a sector that plays a critical role in providing ecosystem services but faces particular barriers and challenges to finance, providing an integrated suite of support that can include technical, business and legal resources.

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EcoDecision is a social enterprise dedicated to developing new ways to finance conservation. EcoDecision is a pioneer in the emerging ecosystem services markets of climate change mitigation, water source protection and biodiversity conservation.

Established in 1995 by Jacob Olander and Marta Echavarria, EcoDecision is based in Quito, Ecuador, and works throughout Latin America with a broad array of clients and partners, including international and national non-governmental organizations, businesses, and government institutions.

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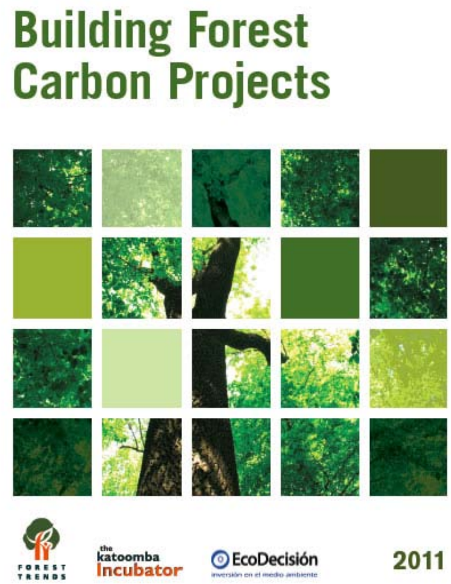

This guidance document is part of a Forest Trends series *Building Forest Carbon Projects*
Available at http://www.forest-trends.org/publications/building_forest_carbon_projects.

Other documents in this series, referred to throughout this document, include:

Step-by-Step Overview and Guide
Jacob Olander and Johannes Ebeling

REDD Guidance: Technical Project Design
Joerg Seifert-Granzin

AR Guidance: Technical Project Design
Johannes Ebeling and Alvaro Vallejo

Carbon Stock Assessment Guidance: Inventory and Monitoring Procedures
David Diaz and Matt Delaney

Community Engagement Guidance: Good Practice for Forest Carbon Projects
Tom Blomley and Michael Richards

Legal Guidance: Legal and Contractual Aspects of Forest Carbon Projects
Slayde Hawkins

Social Impacts Guidance: Key Assessment Issues for Forest Carbon Projects
Michael Richards

Biodiversity Impacts Guidance: Key Assessment Issues for Forest Carbon Projects
John Pilgrim, Jonathan Ekstrom, and Johannes Ebeling

Acronyms

ACR	American Climate Registry
ALM	Agricultural Land Management
AR	Afforestation and reforestation
CAR	Climate Action Reserve
CCB	Climate, Community & Biodiversity [Alliance or Standards]
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CSR	Corporate social responsibility
ERPA	Emissions reduction purchase agreement
EU ETS	European Emissions Trading System
GHG	Greenhouse gas
IFM	Improved Forest Management
IRR	Internal rate of return
lCER	Long-term Certified Emission Reduction
NGO	Non-governmental organization
NPV	Net present value
NTFP	Non-timber forest product
OTC	Over-the-counter
PDD	Project Design Document
PES	Payments for ecosystem services
REDD	Reducing Emissions from Deforestation and Forest Degradation
REDD+	Reducing Emissions from Deforestation and Forest Degradation, conservation of forest carbon stocks, sustainable management of forests, and enhancement of forest carbon stocks
tCER	Temporary Certified Emission Reduction
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
VCU	Verified Carbon Unit
VER	Voluntary Emissions Reduction

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1. The Forest Carbon Business

The opportunity to obtain carbon funding for activities that maintain or increase forest cover is exciting and real. The sector is growing rapidly from historically low transaction volumes as more carbon accounting methodologies are being approved and the number of high-quality projects is increasing. Despite these improving prospects, however, many projects with positive climate impacts will still prove to be financially unviable for a variety of reasons:

- Forest carbon has been largely exclusion from compliance markets, and prices in the voluntary markets are relatively low;
- Not all projects fit accepted carbon accounting methodologies, and hence may not be eligible to be certified under an accepted standard;
- Project development and transaction costs can be extraordinarily high, especially (on a proportional basis) for small-scale projects; and
- High levels of market uncertainty and project risk result in discounted project value.

Successful forest carbon projects must deliver healthy forests while observing the principles that govern business transactions in general, including those having to do with the way buyers and investors account for and mitigate risk.

Accessing carbon markets or the emerging forest carbon funds generally requires an exceptional stretch of land, exceptional people to develop the carbon assets, and exceptional buyers, investors, and/or donors with cash in hand. Developing truly viable forest carbon opportunities requires rigorous analysis and strategic selection of sites and activities.

For many in this field, forest conservation or restoration is the primary project goal, and carbon finance is the means, or perhaps one of several funding possibilities. However, from the business perspective of carbon markets and funds, forest conservation and restoration are but two of many means of achieving climate change mitigation and adaptation. Unfortunately for many forest carbon project ideas, activities that are perceived as being relatively expensive or risky do not fare well in the competition for carbon funding.

In this chapter, *carbon finance*, *funding*, and *financing* have related, but distinct, meanings:

- **Carbon finance** refers to the general topic of paying for climate change mitigation or adaptation activities.
- **Funding** is money provided, whether from market sales, donations, or financing.
- **Financing** is reimbursable funding that is provided to cover a gap between the time expenses are incurred and revenues are obtained.

The tension between business and conservation objectives is never easily resolved. Carbon-related payments may fall short of what is needed to maintain healthy forests, yet those who pursue forestry and conservation objectives without regard to cost, income, and risk will sooner or later lack the resources required to operate in any funding environment. Successful forest carbon projects must deliver healthy forests while observing the principles that govern business transactions in general, including those having to do with the way buyers and investors account for and mitigate risk.

Project proponents and developers[1] must therefore identify cost-effective activities and create conditions for verifiable performance, being very conservative about assumptions related to carbon credit volumes, pricing, transaction costs, project performance, etc., so that they can focus their energies on viable activities.

This chapter is designed to help project proponents and developers build a business case and identify realistic opportunities for obtaining carbon-motivated funding. A strong emphasis is placed on generating project revenues, without which financial tools are meaningless. Then, starting with tools for pre-feasibility analysis, this chapter provides guidelines for business planning and financing the gap that typically exists between early project development expenses and the first carbon or forestry revenues.

1. Preliminary assessment (Section 2)	• How likely is it that the project will be financially viable? • What basic information is needed, and what are key uncertainties?
2. Focusing on revenues (Section 3)	• What are the possible sources of revenue and support for the project (carbon and non-carbon, market and non-market)?
3. Developing the carbon product (Section 4)	• How can the carbon offset be designed to create the greatest value, and to whom?
4. Minding the money and bridging the financial gap (Section 5)	• What are the costs, and how can they be covered until the project begins generating revenues? • What options exist if costs exceed overall revenues? • How can financial risk be assessed and mitigated or avoided?

2. Initial Assessment of Financial Feasibility

As mentioned in the Step-by-Step Overview and Guide part of this series, it is crucial to have a sound assessment of viability from business as well as technical perspectives before undertaking a large investment in forest carbon project development. Unfortunately, many projects are initiated without a real concept of long-term business feasibility, resulting in a great deal of wasted effort. The initial feasibility assessment serves as the starting point for ongoing assessment of project viability, as more refined information becomes available, until the verified emission reductions are sold - or until a decision is made to abandon the project and focus remaining energy and resources on more productive projects. A preliminary conservative feasibility analysis should be conducted at the very outset of project conceptualization.

> Legal aspects of the project fundamentally affect financial feasibility. See the Legal Guidance of this series for a full discussion of these issues.

2.1 Obtaining and Evaluating the Data

Very rough estimates of carbon stocks can be made based on the region and the type of vegetation, often based on research done in nearby areas. Historical deforestation rates have been estimated for many areas and may be

[1] In this series, the term "project proponents" is used to refer to those individuals or organizations generally responsible for the overall organization, management, and legal representation of the forest carbon project. "Project developers," on the other hand, is used to refer specifically to entities tasked with the technical design aspects of the project as required by the carbon and/or co-benefit standard(s).

publicly available, though care must be taken to consider whether published rates apply to the specific project's boundaries. Some resources, such as USAID and Winrock International's online Forest Carbon Calculator,[2] draw on many publicly-available databases to provide preliminary estimates of carbon benefits of AR, REDD, and Improved Forest Management (IFM) activities around the world.

Figure 1 shows how these factors combine with others (such as carbon prices) to yield an estimate of annual cash flow in a hypothetical REDD project. In this example, a 100,000-hectare area might yield an average annual benefit of about US $155,000, assuming that all carbon credits can be sold.

Figure 1. Pre-feasibility Analysis of a Hypothetical REDD Project

Buffer and leakage are presented as annual averages. Refer to Section 4.3 on carbon prices.

Carbon Stock Calculation:						
500 tCO_2/ha	*	100,000 ha			=	50,000,000 tCO_2
Average Carbon Density		**Area**				**Carbon Stock**
Baseline Emissions Calculation:						
50,000,000 tCO_2/year	*	0.2%	*	90%	=	90,000 tCO_2/year
Carbon Stock		**Deforestation Rate**		**Carbon Stock Reduction** after deforestation		**Annual Emissions**
Calculation of Emissions Reductions						
90,000 tCO_2/year	*	70%			=	63,000 tCO_2/year
Annual Emissions		**Effectiveness Avoiding Deforestation and Degradation**				**Emissions Reductions**
Adjustments to Determine Marketable Emission Reductions:						
				20% **buffer (permanence risk)**		(12,600) tCO_2/year
				20% **leakage**		(12,600) tCO_2/year
				Marketable Emission Reductions		**37,800 tCO_2/year**
Valuation:						
		...assuming a price of	$5.00	per ton of carbon, worth		$189,000 per year
		less	20%	Sales Commission		($15,120)
						$173,880 per year
		less	10%	Government Share		($18,900)
Net amount available for forest protection, community distribution for opportunity cost etc.:						**$154,980/year**

Already, one may have a sense of the financial viability of this hypothetical project. If US $155,000 per year is clearly insufficient to protect 100,000 hectares of land, including the agricultural or other interventions this may entail, it can be concluded that this project is not feasible without additional non-carbon revenue streams. An area with greater carbon density and greater threat of deforestation would clearly have better prospects.

For the sake of illustration, let us assume that it will cost $200,000 initially to develop the project summarized in Figure 1 and $130,000 each year thereafter to implement it. As shown in Figure 2 below, the project appears to have a simple payback period of 8 years, and it appears to be profitable after that.

[2] An overview of this tool is available at: http://www.usaid.gov/our_work/environment/climate/docs/forest_carbon_calculator_jan10.pdf.

Figure 2. Hypothetical REDD Project Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
Cash Inflows											
Carbon revenues	-	155	155	155	155	155	155	155	155	155	155
Cash Outflows											
Project development costs	(200)	-	-	-	-	-	-	-	-	-	-
Implementation costs	-	(130)	(130)	(130)	(130)	(130)	(130)	(130)	(130)	(130)	(130)
Total Cash Flow											
	(200)	25	25	25	25	25	25	25	25	25	25
Cumulative Cash Flow											
	(200)	(175)	(150)	(125)	(100)	(75)	(50)	(25)	-	25	50

Note: Indicative figures in units of US $1000. Brackets denote negative cash flows.

Such a project may however still not be financially viable because cash flows in future years must be discounted. A given sum of money today is worth more than the same sum one, two, or many years from now. This time value of money can be expressed as an annual "discount rate" and varies by individual or entity, usually according to that person's weighted average cost of capital, or the rate of return that could be received on alternative investments with similar risks (see more on discount rates in Section 5.5).[3] In the example below, a 12% discount rate is used.[4]

Figure 3. Discounted Cash Flow

Year	0	1	2	3	4	5	6	7	8	9	10
Total Cash Flow											
	(200)	25	25	25	25	25	25	25	25	25	25
Discounted Cash Flow											
Discount Rate: 12%	(200)	22.3	19.9	17.8	16.0	14.2	12.6	11.3	10.1	9.0	9.0
Cumulative Discounted Cash Flow											
	(200)	(177.7)	(157.8)	(140.0)	(124.1)	(110.0)	(97.2)	(95.9)	(75.9)	(66.8)	(58.7)

Note: Indicative figures in units of US $1000. Brackets denote negative cash flows.

When adjusted for the time value of money, the project appears less viable. After 10 years, the project has an overall net cost (a loss) of $58,744 in today's dollars. Another way of saying this is that the net present value (NPV) of the project is -$58,744 (negative) after 10 years. In fact, it will take 30 years for this project to "break even" at this discount rate.

An internal rate of return (IRR) is often calculated to evaluate project viability. The IRR is simply the discount rate at which the discounted costs equal the discounted benefits over time (total discounted cash flow sums to zero). If this

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[3] When determined in these ways, the discount rate typically includes the impact of inflation. In that case, the project's cash flows should be calculated with inflation. If "real" discount rates are used, non-inflated figures should be used. If taxes are included in the analysis, the cost of capital should be calculated on an "after tax" basis.

[4] To calculate the discounted cash flow in any year, divide that year's net cash flow by $(1+r)^y$, where r is the discount rate and y is the project year. Note that the first investment year is denoted year 0, so that year 1 is simply the first year of operations. More finely-grained calculations can also be made by month or other timescale, provided that the discount rate is appropriate (e.g., 1/12 times the annual rate for monthly calculations).

were a 30-year project, we could say that the IRR is about 12% because over that period and at that discount rate the present value of the benefits is equal to the present value of the costs. Viable projects generate an IRR greater than the applicable discount rate, and thus a positive NPV.

Unfortunately, the actual cost of capital for forest carbon projects is much higher than 12%: it can legitimately be in the 50 to 100% range given typical project and market risks as of the time of this writing.[5] If this hypothetical project has a risk profile typical of many forest carbon projects in early stages of development, the application of a corresponding higher discount rate would show this project to be – at first glance – totally unviable. See Section 5.5 for a full discussion on risk and discount rates.

It is very important to be realistic and conservative in feasibility estimates.

It is very important to be realistic and conservative in (pre-) feasibility estimates. Projected benefits in forest carbon projects are often over-estimated and the implementation and transaction costs are commonly underestimated in the (pre-) feasibility stage. Projects that appear to already have a low or barely acceptable IRR at the pre-feasibility or feasibility stage nearly always become financially distressed during implementation.

2.2 Financial Models

The cash flow calculations and analyses presented in the previous section can serve as the basis of a financial model for an initial financial assessment. A financial model is generally a spreadsheet that calculates revenues, costs, and financial returns based on certain variable parameters, such as the price and amount of carbon credits produced by the project. Many feasibility assessment tools described in the Step-by-Step Overview have basic, built-in financial models, such as the Tool for Afforestation and Reforestation Approved Methodologies (TARAM) developed by the BioCarbon Fund and CATIE and the CCBA-SocialCarbon REDD feasibility tool (see also Box 3).

However, it may be necessary to develop a tailor-made financial model to capture the unique characteristics of the project and to go beyond simple pre-feasibility calculations. Forest carbon projects are not different from other enterprises in this respect. External consultants can assist with financial modeling, but the advantage of developing aspects of a financial model internally is that it helps the project proponent or developer to understand the factors that lead to viability or non-viability.

If the project appears feasible, a more detailed financial analysis can be constructed to guide investment, commercialization, and other business decisions.

[5] Based on actual investor term sheets and estimates viewed by the authors in 2010. If discount rates over 50% seem alarmingly high, please refer to the discussions of risk in Sections 4.3 (pricing) and 5.5 (discount rates).

3. Sources of Revenue and Support: Markets, Government, and Civil Society

With a basic sense of the project's viability, one should begin to think about the different sources of revenue to fund its development and operation. The main source of revenue and mix of funding is different for each project. In ideal circumstances, projects can benefit from private sources of funding, such as international carbon markets, as well as public sector and civil society support. Historically, governments have been the largest supporters of forest carbon projects, while markets have played a smaller but still vital role. Civil society organizations do not usually provide much funding on their own, but often provide legitimacy and technical capacity, and some non-governmental organizations (NGOs) can channel public and charitable funding for projects with high social and biodiversity value.

Forest carbon markets remain small and somewhat controversial.

Table 1. Conditions Favoring Market, Government, and Civil Society Support

	Market Support	Government Support	Civil Society Support
Project Characteristics	High volume of carbon credits (large area of land, large carbon stocks under identifiable threat, approved methodology)	Involves public land (or government asserts carbon rights, regardless of land tenure)	Small scale
Project Impacts and Co-benefits	Complementary revenue streams (timber, NTFPs, tourism, and other non-carbon products may be key to financial viability)	Generates a public good (fulfills the mission of a public-sector agency that champions the project)	Highly positive environmental impact (especially biodiversity) Highly positive social impact
Cost of Abatement	Low cost of abatement (implementation and transaction costs)	Moderate cost of abatement	Moderate cost of abatement
Policy Environment	Market-friendly Low legal and regulatory risk	Supportive policies on PES (political decision to value ecosystem services, budget availability)	Strategically leverages public policy reforms or market support
Agency	Corporate champion	Public sector champion	NGO champion

3.1 Forest Carbon Markets

In the early 1990s, the first purchase and sale of forest carbon credits took place, beginning what has grown to become today's multi-billion dollar carbon markets. These markets are driven by enterprises in the private and public sectors that purchase carbon offsets – whether voluntarily or to comply with regulation – to compensate for emissions reductions that they do not achieve on their own. However, due to concerns about permanence, leakage, and measurement and monitoring, carbon project offsets have been excluded from the world's largest carbon market, the European Union Emissions Trading Scheme (EU ETS), and also have limited access to other "compliance" markets.

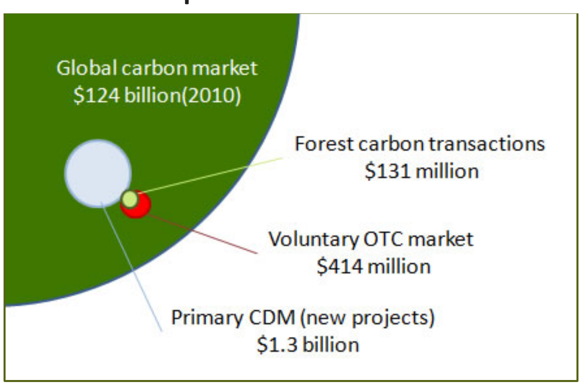
Therefore, more than 90% of forest carbon transactions to date have occurred in voluntary markets (Hamilton, Chokkalingam and Bendana 2010), and the volume of forest carbon transactions in relation to the size of the overall carbon market has been almost negligible until 2010 and remains small, as illustrated in Figure 4.

3.1.1 Compliance Markets

Forest carbon offsets are eligible in markets created by the Clean Development Mechanism (CDM),[6] the New South Wales and New Zealand emissions trading schemes, and certain regional (Northeast) and state (California, starting in 2013) programs in the US. However, the rules pertaining to international sourcing of forest carbon offsets have been highly restrictive, resulting in trading of under a few million dollars per year.

AR projects were allowed under the CDM, but Certified Emissions Reductions (CERs) from forestry are considered temporary (issuing units known as either tCERs or lCERs), meaning that buyers must repurchase them every few years or replace them with permanent CERs from non-forest sources. Only 27 forestry projects were registered under the CDM as of June 2011, compared to 3205 projects overall (UNFCCC 2011). Other than the World Bank's BioCarbon Fund, there are relatively few tCER buyers.

Figure 4. Global Forest Carbon Transaction Volume in Perspective



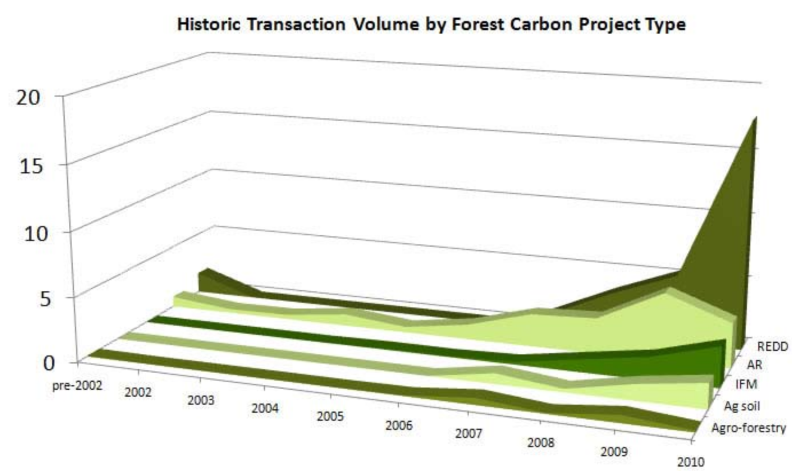
Source: Peters-Stanley, et al. (2011) and Ecosystem Marketplace (2011, forthcoming)

Prospects exist for increased demand for international forest carbon from compliance markets. However, Phase 3 of the EU ETS (2013-2020) will continue to exclude tCERS, and California's cap-and-trade market will allow a very small volume of international forest carbon offsets in the first years of implementation (though there is likely to be a sizable demand for domestic, US-based forestry carbon offsets). While the science of forest carbon measurement and monitoring has improved dramatically in recent years, forest carbon markets will remain small – limited mainly to voluntary markets – until the world's large industrial emitters of carbon are clearly allowed to purchase large volumes of forest carbon offsets from around the world to meet mandatory emission reduction targets.

[6] Although CDM forestry credits can currently only be used by governments to meet their Kyoto Protocol targets, and not by companies covered by the EU ETS.

3.1.2 Voluntary Markets

Figure 5. The Rise of REDD in Voluntary Forest Carbon Trading



Adapted from: Peters-Stanley, et al. (2011).

As mentioned above, an overwhelming majority of forest carbon transactions occur in voluntary markets. Even so, many voluntary buyers are motivated by the prospects for eventually trading offsets at higher prices in compliance markets created by state, national, or international regulations. Carbon prices in the voluntary markets are therefore highly correlated with expectations for more stringent climate change agreements. Many observers believe that offsets from REDD+ projects certified to the Verified Carbon Standard (VCS), as well as Climate Reserve Tonnes issued according to Climate Action Reserve (CAR) protocols in the US, will eventually be accepted in compliance markets. In EcoSecurities' 2010 Forest Carbon Offsetting Survey, 26% of respondents reported to be motivated by a potential global scheme, and 32% indicated that they were influenced by the prospect of US climate change legislation.

Forest Trends' and Bloomberg New Energy Finance's *State of the Voluntary Carbon Markets 2011* reports that the volume of forest carbon trading in voluntary over-the-counter (OTC) markets increased dramatically to $126 million in 2010, though the amount of money actually flowing to forest carbon projects is probably closer to $100 million because some of the trading is between intermediaries. This compares to less than $6 million transacted in CDM markets, including trades between intermediaries.

3.1.3 Market Forecast: Growth and Volatility?

There is reasonable hope that forest carbon markets will grow with demand from compliance markets. However, it is not certain that this will happen, what standards might be eligible, or whether international funding for REDD+ activities will be mediated more by governments as opposed markets.

As with any industry on the cusp of rapid growth and change, there is likely to be significant volatility in forest carbon markets.

If forest carbon markets do grow to a size that is proportional to the global share of forest-based carbon emissions, there will likely be continued market volatility, as there would be with any rapidly changing industry. For example, if a glut of forest carbon projects follows the approval of new VCS methodologies, the price of forest carbon credits would likely drop if there is not a simultaneous increase in demand.

3.2 Government and Philanthropic Support

The public and philanthropic sectors have been and will continue to be a significant funder of forest carbon projects, and of activities that build capacity and an enabling environment for private investment. Public support can take the form of policy reform, grants, low-interest loans, guarantees, tax incentives, research funding, standard setting, and regulatory initiatives. Many of these instruments can translate into improved project revenues, even though they may not be directly available to project developers. Given the financial and market challenges faced by many innovative forest carbon projects – especially those with very strong social and environmental co-benefits – access to donor resources may be critical.

> *It is likely that carbon revenues alone will be insufficient to sustain a healthy forestry or forest conservation project.*

Central governments, international development agencies, development banks, and philanthropic foundations have already supported numerous forest carbon projects. For example, Conservation International reports that 12 philanthropic and 4 government sponsors provided financial support to their 12 forest carbon projects, compared to only 6 private carbon buyers (Harvey, Zerbock and Papageorgiou 2010) – an indication of the difficulty of attracting private investment given the risk/return profiles common in this sector.

Public sources of funding can be characterized as follows:

- **Bilateral development cooperation**: American, European, Japanese, and Australian development agencies are frequent supporters of carbon projects. Following the 2009 UN climate conference in Copenhagen and the 2010 conference in Cancun, a number of countries have committed "fast start" climate financing, part of which is set aside for forest carbon projects.[7]
- **National project development:** Many countries (e.g., Brazil, Costa Rica, China, and Vietnam) have funded their own forest carbon programs. In addition, many project support schemes from multilateral institutions (e.g., the World Banks's BioCarbon Fund) feature public sector proponents or some type of public-private partnership.
- **Multilateral organizations**: The World Bank has a large number of carbon finance initiatives, some of which support forestry activities. As of this writing, however, *only* the Forest Carbon Partnership Facility (which supports large government programs) and the BioCarbon Fund are currently accepting Project Idea Notes (PINs) for forest carbon projects.[8]
- **Emerging funds**: Several governments are establishing post-2012 public sector climate funds. Many of these funds are designed to support broad government initiatives, though some may fund project-level activities, either directly or through national governments.[9]
- **Private philanthropy**: The amount of funding from private philanthropy for forest carbon projects probably exceeds the net proceeds from forest carbon market sales; however, this condition will probably only last as long as private donors believe their funding will help leverage larger pools of market and government funding. Large, international NGOs often have good access to private philanthropy and public sector funding, which can benefit local project partners.

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[7] These pledges are tracked at http://www.wri.org/publication/summary-of-developed-country-fast-start-climate-finance-pledges.

[8] Proponents may submit their prospective project's PIN to the BioCarbon Fund at http://wbcarbonfinance.org/Router.cfm?Page=SubmitProj&ItemID=24683

[9] Details on funds are available at www.climatefundsupdate.org.

Public sector and philanthropic funding may in some cases require somewhat less rigorous accounting of emission reductions at the project level. However, performance should in any case be verifiable and quantifiable to some degree as donors increasingly want assurance that the incentives they provide are indeed effective.

3.3 Non-Carbon Revenues

In many cases, carbon revenues will be insufficient to sustain a sound forestry or forest conservation project. Except for very specific situations, such as peatland REDD projects in South-East Asia with extraordinarily high carbon values in relation to abatement costs, carbon revenues will need to be complemented by other income streams. As with carbon revenues, however, projects must be realistic and conservative about other revenue projections, especially for endeavors in which the project proponent has little experience (e.g., commercial timber production by communities and NGOs). Where complementary revenues are feasible, the proponent will need to prove additionality (i.e., that without carbon payments the project would be unfeasible).

Timber

The most obvious complementary revenue stream for most forest carbon projects is timber. Carbon payments, whether for reforestation or forest conservation, are not incompatible with the well-managed harvest of timber, as long as the impacts can be predicted and quantified. In fact, land that is under active, visible sustainable forest management may be more resilient to outside pressures. If timber harvesting is a goal, check for a methodology that will permit this activity – not all AR, IFM, and REDD methodologies do.

Agroforestry, Ecotourism, and Non-Timber Forest Products

Other revenues may be obtainable for agroforestry products (coffee or cocoa), non-timber forest products (NTFPs), ecotourism, etc. However, care should be taken that revenue projections are realistic and rely on sound market studies and production capacity; experience has shown that project participants are frequently overly optimistic in this context.

Other Ecosystem Services

It may also be possible to stack payments for other ecosystem services such as water quality, biodiversity protection, soil protection, and the like, although it can be very difficult or impossible to find buyers for these services.[10]

To avoid problems in proving additionality, it is advisable to present the project as a whole, rather than as a carbon project and a separate payments-for-ecosystem services (PES) project. If either type of payment could by itself make the overall project viable the other type of payment could fail an additionality test. However, if it can be shown that both revenue sources are required to conserve the forest in question, a project will likely pass both additionality tests.

Public Relations Value

Project proponents and developers should not underestimate the value of their “story” to potential buyers that want to demonstrate corporate social responsibility (CSR). In some cases, the CSR value of a buyer relationship may exceed the value of the carbon sold, especially for small, charismatic projects.

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[10] If such services are an important element of the project, a helpful guidebook is Prince and Waage, *Negotiating for Nature’s Services* (2008), available at http://www.katoombagroup.org/documents/publications/NegotiatingforNature.pdf.

4. Marketing: Creating Forest Carbon Value

Not all carbon credits are created equal. Some are valued more highly than others, and some are never bought at all. Project proponents must understand what gives carbon offsets value if their project is to rely on carbon market revenues to any significant extent.

Marketing is the process of finding the right match between buyer needs and product attributes. It is broader than the concept of commercialization in that it involves the very process of identifying and designing the carbon product itself; commercialization is but one (important) component of marketing understood in this comprehensive way. Marketing is therefore central to the creation (and perception) of carbon value and key to project viability. Market value is generated through variations of four factors:

- Product,
- Price,
- Placement, and
- Promotion.

Effective marketing starts with the needs of the client in mind, whether that is a corporation seeking to boost their reputation, a private buyer looking to efficiently offset his own emissions, or a government agency pursuing a public good.

4.1 Understanding Buyers

While published reports provide essential background information, there is no substitute for engaging a variety of prospective buyers, or their brokers, directly and asking them about their specific needs and objectives. This should be done prior to finalizing certain key aspects of project design and carbon standard choice as this may influence the products (characteristics of carbon credits) that will be delivered. When approaching prospective buyers, it is important to ask two critical questions:

1) Does the prospective buyer have a structured program to purchase carbon offsets (e.g., as part of an ongoing carbon management strategy)? If not, considerable effort may be required to negotiate a transaction, with relatively high risk of not closing a deal at all.
2) What are the buyer's attitudes towards offsets from forestry projects? Despite changing attitudes, many buyers have tended to prefer non-forest carbon offsets or to source only a small portion of their offsets from forestry projects.

It is essential to develop a clear understanding of the needs and expectations of buyers and public sector agencies that support forest carbon projects.

Other key questions for understanding the needs and expectations of buyers include:

- What are the buyer's overall goals and challenges? How do the buyer's overall and carbon-specific goals affect the buyer's potential interest in particular offset products?
- Is the buyer going to retire the offsets or sell them on in the future?
- Would the buyer enter into a forward-looking emissions reduction purchase agreement (ERPA)? ERPAs that commit the buyer and seller to one or more future purchases of credits can be extremely valuable because

they provide some assurance of future demand for the seller and future supply for the buyer. ERPAs can also set fixed prices, lowering the project's risks further. See the Legal Guidance of this series for additional information on ERPAs.

- Is the buyer willing to pay up front for some project development costs or to provide up-front payments under a forward purchase of carbon credits (e.g., under an ERPA)? Because such up-front payments represent an investment that involves a significant risk on the part of the buyer (it is uncertain whether the project will perform as planned and deliver the credits), the carbon price will likely be discounted. See Section 5.5 below for a more detailed discussion of risk and pricing.

4.2 Product

Carbon offsets are unlike other products in many ways. Buyers cannot see, feel, hear, taste, or smell the difference in atmospheric carbon attributable to their purchase. The intangibility of the product creates particular needs for product definition, clarity in communication, and contracting with buyers.

Although carbon credits are frequently described as commodities, which would imply that credits from various sources all have equal value, markets do differentiate between credits with regards to several aspects. There is a particularly high degree of differentiation in voluntary OTC markets, but even compliance markets are increasingly sensitive to, for example, factors that impact the eligibility of CDM credits in the EU ETS, where future phases will place restrictions on certain geographies of origin, project types, and vintages.

This differentiation can have a dramatic effect on prices, the allocation of risks between buyers and sellers, and the basic financial structure of projects. Below are some of the more important variables in the context of voluntary forest carbon markets:

- **Selection of carbon standard and accounting methodology**. Carbon accounting and project design standards largely define what a carbon credit represents. For example, the greenhouse gas (GHG) benefits of a REDD project depend fundamentally on assumptions about baseline deforestation rates, carbon stocks, and start dates.[11]

  Some differences between carbon standards are more subtle. For example, the allocation of risks is influenced by accounting standards: *ex-ante* accounting methodologies such as CarbonFix and Plan Vivo produce carbon credits before the carbon is actually sequestered, whereas *ex-post* verification – preferred by many buyers – allows for the production of credits only after GHG benefits have been measured and verified. Even if up-front payments can be achieved through forward sales of *ex-post* credits, important differences with respect to project risk remain.[12]

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[11] Suppose there are two REDD projects on identical stretches of land with identical risk of deforestation and identical cost of project implementation. Seller A assumes that the entire forest carbon stock will eventually be destroyed, so the volume of emissions reductions sold is equal to the estimated carbon stocks on the land. Seller B projects gradual deforestation over a limited time horizon and concludes that only 20% of the forest is at risk of deforestation over that period. Compared to Seller B, Seller A uses a less-rigorous standard and offers a larger volume of credits for sale; thus he is able to charge a relatively lower price per tonne to break even. Seller B's offsets, however, are more likely to reflect the real climate benefits. Sellers A and B offer fundamentally different products in terms of offset quality. Such variation still exists in the market.

[12] For example, suppose that in 2010 a project executes a forward sale of 5,000 tonnes of ex-post carbon credits with a vintage of 2015. If the forest burns down before 2015, no credits would be delivered. This would cause a loss for the buyer, or under some ERPAs could create a liability on the part of the seller. However, if the project developer sells 5,000 *ex-ante*

- **CCB certification.** Many voluntary market buyers strongly prefer – and will pay a premium for – credits with reasonable assurance of positive biodiversity and social impact. In fact, CCB certification is becoming a *de facto* requirement for forest carbon projects in voluntary markets.
- **Type of forestry project.** Most buyers in the voluntary markets distinguish between project types (e.g., AR with native species versus REDD) they want to be associated with.
- **Geography.** Many buyers prefer projects from particular regions (e.g., their own home continent or Least Developed Countries).
- **Vintage.** Carbon credits generated in the recent past are generally more highly valued than those generated long ago or in the future.
- **"Story."** In voluntary markets, CSR and public relations are the primary motivations for offset purchases, and anything a project can do to distinguish itself in a positive way – to tell a good "story" – will have a favorable impact on price. The involvement of particular stakeholders, good photographic and other documentary evidence, iconic species, or easily identifiable social impacts all enhance value.

Less important sources of product differentiation include:

- Selection of third party validation / verification companies;
- Involvement of particular stakeholders; and
- The selection of registry (or the decision not to register offsets).

It should be noted that pre-compliance buyers may have different priorities than buyers who intend to retire the offsets themselves. For example, the key concern for some pre-compliance buyers who anticipate resale of credits is that they will be accepted in future compliance trading regimes (with the currently safest "bet" being on credits based on VCS or CAR protocols).

4.3 Pricing

The differentiation of carbon offsets in voluntary markets means that there is no single price applicable to all projects, even within project types. For example, in 2010, forest carbon prices averaged about $5.50/tonne, but ranged from under $1 to over $30/t, according to Ecosystem Marketplace's forthcoming *State of the Forest Carbon Market* report.

Where a project manages to fall within this wide range of prices depends to a large extent on decisions that define the carbon credit "product" and respond to buyers' needs, as discussed in the previous sections. The following factors are particularly important:

- **The risk assumed by the buyer**. The allocation of risk has an extraordinary impact on price. In forward sales, or where project development costs are financed by the buyer, the buyer is in effect making an investment with some risk, which will be reflected in a lower (discounted) price.

credits with 2015 vintage (for example as *VERfutures* under Carbon Fix), the project developer may only be liable for replanting the area so that the amount of carbon sold will eventually be sequestered.

Table 2. Discounting for Risk

Risk Level	Common Scenario	Hypothetical Discount Rate
Low	Project validated, with history of carbon credit delivery, stable business environment	10%
Medium	Project validated, emission reductions not yet verified	20%
High	Project not validated, little experience with project type	50%
Very High	PDD still in development, uncertain tenure, poor business environment, first-of-a-kind transaction…	100%

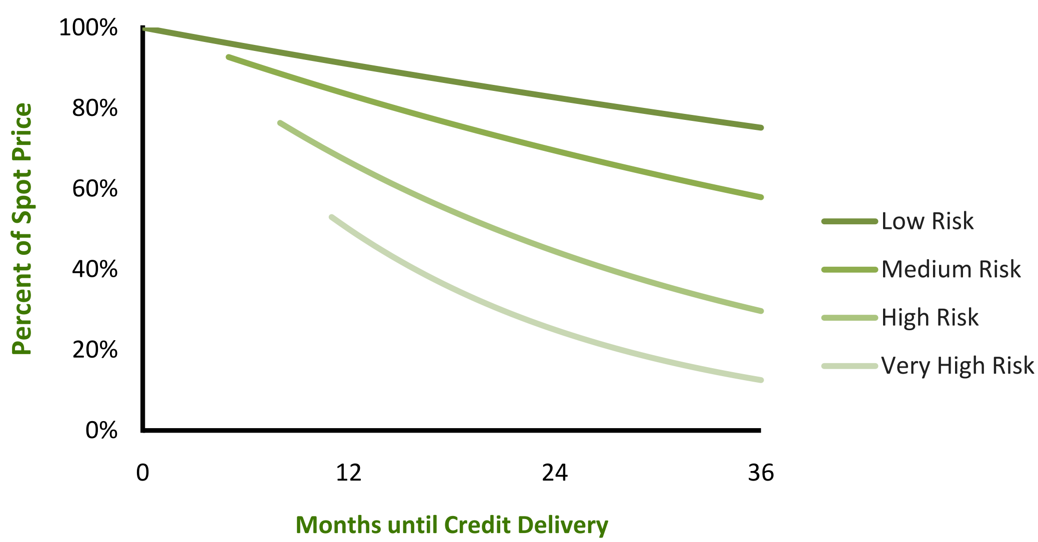
For more information on risk and its relation to price, see Figure 6 below and Section 5.5.

A special category of risk that buyers pay much attention to is reputational risk: especially considering that offsetting is usually a CSR or public relations-oriented exercise, the last thing a buyer wants is to be associated with a project that appears to result in social or environmental problems.

- **The timing of sale and payment.** Credits delivered (e.g., as Voluntary Emissions Reductions, or VERs) at the time of payment ("spot" sales) should command a higher price than credits sold "forward" (prior to issuance). Sellers often offer and buyer/investors demand a price discount in exchange for advance payments. In many cases the price differences owing to the timing of the sale is related to delivery risk, as mentioned above and depicted in Figure 6 below. However, a forward sale has value to the seller even if no cash changes hands until credits are issued, because a commitment to purchase credits in the future reduces project risk and can therefore enable the seller to obtain financing at a lower rate.
- **Additional options rights granted to the buyer.** Some ERPAs grant rights to the buyer to purchase additional credits from the project, at a certain price. Such options rights can be quite valuable if future market prices are higher than the agreed on or "strike" price.
- **The volume of credits sold.** Retail sales usually command higher prices than wholesale transactions, but they involve much higher transaction costs.

Figure 6. Theoretical Effect of Risk and Payment Timing on Price

Based on discount rates of 10%, 20%, 50%, and 100% to reflect increasing levels of risk.



- **The carbon accounting and project design standards used**. It is difficult to assess how standards affect prices. Credits issued by some of the less-popular standards, such as Plan Vivo and CarbonFix, can command higher prices than VCS and CCB certified credits, but this likely reflects factors mentioned above, such as transaction size and risk. For example, Plan Vivo and CarbonFix certify credits *ex-ante* – allowing *certified* credits to be sold before climate benefits are actually achieved. Most buyers of *ex-post* credits also pay before the climate benefits are actually achieved, but they discount prices to reflect the risk that the credits will not be certified. The assurance of certification may be more important than the assurance actual climate benefits for some buyers.

With all of this variability, how does one assign a price to any specific transaction? There is no single formula; one simply has to be aware of published prices, communicate the project attributes, solicit multiple bids, and negotiate!

Price Projections

It is difficult to confidently project carbon sales revenues, unless prices for the entire generated credit volume is fixed in an ERPA. Even once an ERPA is agreed, this may include fixed and floating price elements (which split the risk and benefits of future price fluctuations), and an ERPA may not cover all of a project's credits.

Once again, it is best to be conservative in one's revenue projections. It is unwise to assume that the future prices of carbon will be much higher than they are today when evaluating the value or viability of a project – future demand and supply are highly uncertain.

4.4 Promotion and Placement: Brokers and Registries

A common misconception of forest carbon project proponents is that their credits will find an easy market. However, the universe of significant forest carbon buyers is relatively small and many have particular ideas about the carbon offsets they are willing to purchase. Sales are often made through personal networks. Although sales may be generated through registries and exchanges, most projects will do well to enlist the aid of a carbon market broker with better access to buyers.

Brokers

Brokers are matchmakers between buyers and sellers of carbon credits (they do not buy the credits themselves). These intermediaries are particularly important in OTC markets, which lack liquidity and transparent prices set through an automated exchange, because of their contacts with a large number of buyers and experience with product placement and pricing. Brokers can help negotiate an ERPA or find buyers for issued credits, and some may even offer project development services or cover certain transaction costs (for a higher commission). The typical commission of around 3% to 8%, depending on the range of services provided, may be well-invested.

Brokerages vary in their geographical presence, their market focus (e.g., on compliance or voluntary markets), their expertise in particular types of projects, their buyer network, their commission structure, and their culture; all of these factors should be taken into consideration when selecting the right broker for a particular project. The annual *State of the Voluntary Carbon Market* report includes a list of the world's major brokerage firms.

Registries

Most offsets transacted in voluntary markets are tracked by registries such as Markit, NYSE Blue, CDC Climate, and American Carbon Registry (ACR). Under the CDM, all credits are logged in a registry administered by the CDM's Executive Board. Registries provide an extra level of accountability and assurance regarding issuance, holding, and acquisition of credits. Registries do not actively market offset credits, but buyers may become aware of credits available for sale through a registry.

For more information to understand markets and to develop a marketing plan, consult the resources listed in Box 1 or contact a reputable broker.

Box 1. Key External Guidance for Marketing Forest Carbon Projects

Peters-Stanley, Molly, Katherine Hamilton, Thomas Marcello, and Milo Sjardin. *Back to the Future: State of the Voluntary Carbon Markets 2011.* Washington, DC: Ecosystem Marketplace, 2011.

Hamilton, Katherine, Unna Chokkalingam, and Maria Bendana. *State of the Forest Carbon Markets 2009: Taking Root and Branching Out.* Washington, DC: Ecosystem Marketplace, 2010.

Ecosystem Marketplace. *State of the Forest Carbon Markets 2011.* Washington, DC: Forest Trends, 2011, forthcoming.

> *Extensive, must-read information on voluntary carbon markets can be found in the State of the Voluntary Carbon Market and the State of the Forest Carbon Markets reports. These reports are available at http://ecosystemmarketplace.com/.*

Neef, Till, et al. *The Forest Carbon Offsetting Report 2010.* Dublin, Ireland: EcoSecurities, 2010. Available at http://www.ecosecurities.com/Standalone/Forest_carbon_offsetting_report_2010/default.aspx.

> *EcoSecurities has published several annual surveys of forest carbon buyers with highly valuable market insights.*

More current market analysis can be found at Ecosystem Marketplace (see above), Point Carbon (http://www.pointcarbon.com/), and elsewhere.

5. Financing the Production of Forest Carbon

As the project design comes into sharper focus and findings of feasibility assessments become available, the financial model needs to be further refined. This concerns the "carbon project" as well as the broader forestry or land-management enterprise (or "underlying project") of which emission reductions may constitute a small part. It is crucial to keep in mind the financial viability of the entire enterprise when assessing the carbon project component, which is the focus of this chapter.

The costs of the carbon project can be divided into three categories:

- Project development and set-up costs (feasibility work, project design documentation, etc.);
- Implementation costs (planting, managing and/or protecting forests); and
- Market transaction costs (issuance, brokerage, etc.).

Once the magnitude and timing of project expenses and revenue streams are modeled, strategies need to be defined for financing the periods of negative cash flow that typically occur from project inception until at least the first major carbon sales (and possibly longer).

5.1 Project Development and Set-up Costs

The activities described in the various chapters of this guide all require time, trained people, and financial resources. How much? It is very important to keep in mind the relatively small size of current forest carbon markets (see Figure 4) and to be conscious of the fact that very few projects (particularly REDD+ projects) have completed the full cycle towards issuance of carbon credits. This means that there is very limited experience as to how expensive it actually is to develop forest carbon projects of different types, sizes, and locations. Some indicative common project design and set-up costs are noted in Table 3. These can vary enormously depending on project set-up, complexity, and size, and are often significantly underestimated at the outset. For example, baseline projections for most AR projects will involve limited costs but can be extremely complex for many REDD+ projects.

The project development costs in Table 3 are based primarily on VCS and CCB requirements because these standards have come to dominate the market. However, there will likely continue to be some demand for credits from grass-roots projects using niche standards like Plan Vivo and Carbon Fix, or projects that are not certified under any standard but may still yield climate change benefits. It can be less costly to develop a project using a niche standard, and thus more feasible for small projects provided that buyers are identified who will accept the resulting credits.

Table 3. Indicative Forest Carbon Project Establishment Costs

(Through validation)

Project Design and Set-up	Notes and Indicative Amounts (USD)
Local Staffing / Coordination	Human resource requirements are frequently underestimated, particularly if stakeholders are grappling with issues for the first time.
Initial Feasibility Assessment	An initial but thorough assessment of methodological, practical, and financial feasibility of the project idea is essential. $10,000-$50,000
Methodology Development	If there is no approved methodology for the intended forest carbon activities, a new methodology may be created (ideally based on a variation of an approved one) and submitted for approval by the relevant standard-setting body. Although the expense can be considerable ($30,000 to $200,000), VCS channels royalties to methodology developers from other users of the methodology.
Imagery & Analysis for Area Change Detection	Satellite Imagery is often free but processing and analyzing the data is time-consuming. Note that reference regions can be several times the area of the carbon project. Potential processing costs: $4,000-$30,000 for 500,000 ha for one date (change detection requires several dates).
Ground Truth / Forest Inventory	Carbon stock measurement costs mainly depend on project size and forest heterogeneity: $0.50-$2.00/ha for REDD projects
Social and Biodiversity Assessment, Baseline and Monitoring Plan	For CCB certification: $30,000-$50,000+. This amount can vary widely depending on the scale, location and complexity of the project, the methodology used, and the team engaged to undertake it . It could be less if there is in-house capacity and relevant prior work on which to build.
Carbon Baseline Scenario Modeling	The costs of modeling baseline carbon emission scenarios depend on the scale of the project, the heterogeneity and complexity of deforestation drivers and agents, the extent of existing data, and the methods selected and permissible (e.g., projection of historical trends vs. new developments). $20,000 - $60,000
Stakeholder Consultation, Agreements on Benefit Sharing	These costs can vary considerably from project to project, but they are frequently under estimated. Plan on dedicating multiple meetings and regular contact throughout the project.

PDD Drafting and Follow-up	Drafting costs may be relatively low if all the underlying analyses and project design activities have been done well and are well documented. In addition, corrective action requests issued by the validator need to be processed. $25,000-$125,000
Business Planning and Finance	May involve establishment and administration of trust funds or other entities. This could be relatively inexpensive or it could take significant training, particularly for community-managed funds. $5,000-$50,000
Legal / Professional	Legal and professional help may be required: * To clarify legal / marketing rights to carbon. Note that clarifying land tenure can be very valuable to rural participants, but is often extremely challenging. * To facilitate linkages and policy engagement with national and sub-national carbon authorities, and sign-off by the DNA. $10,000-$50,000
Validation (Carbon)	Fees charged by the auditor selected to carry out the validation of the PDD (VCS or CDM): $10,000 - $60,000. Note that the cost of responding to corrective action requests (CARs) will not be included in the initial quote. The project developer and proponent need to have financial depth to stick with the process through its conclusion.
Validation (Social and Biodiversity)	CCB validation can cost more than VCS or other carbon accounting process validation because it requires site-level observation, though many redundant costs can be saved by doing both simultaneously.
Capital Costs	Developing a forest carbon project can take several years before carbon revenues are generated. Any resources advanced for project development, whether in cash or contributed in-kind by project participants, will come at a cost.
Other Design Needs / Contingency	Project proponents and developers must expect the unexpected and plan budget for contingencies. See Section 5.5 on project risks.

In all, project development and planning costs can reach several hundred thousand US dollars – a formidable investment that by itself will do nothing to sequester carbon or conserve forests.

Engaging a Project Developer

Commercial project developers can play a key role in bringing forest carbon projects from concept to reality. Their technical and business expertise can:

- Reduce risk (increase the chances of project success) and the buyer's perception of risk;
- Reduce the time required to generate credits for sale, therefore reducing the cost of financing;
- Increase the price of credits sold by the project by enhancing the project quality and by providing better access to different types of buyers; and
- Reduce transaction costs (e.g., through experience in producing technical documentation and carrying out validations).

Project developers often also act as carbon credit aggregators, sourcing credits from a variety of projects (see Section 4's discussion of ERPAs) and selling them on to secondary buyers (absorbing much of the resulting financial risk). They frequently also take on a majority of transaction costs. Their fees – or margin on the price of primary and secondary credits - can represent a large portion of the value of carbon credits, and some organizations build up their own carbon project development expertise because they are reluctant to "lose" a percentage of the project. This decision, however, should be based on a careful analysis of the respective risks and benefits in terms of technical and practical experience, market knowledge, and financial depth.

5.2 Implementation Costs

The cost of activities that directly result in GHG benefits depend entirely on the strategy selected for creating GHG benefits. These costs typically need to be projected over the life of the project. Common expense categories are listed in Table 4.

Table 4. Common Cost Categories for Forest Carbon Project Implementation

Common Implementation Cost Categories	Observations
General and Administrative	Costs incurred by various stakeholders--including on-going management, legal, and professional costs associated with the project--need to be considered.
Land Acquisition / Rent / Incentives for Land Users	If land is already owned by the project proponents, there may not be a cash outlay for land acquisition, but there is always an opportunity cost for the use of land that may need to be defrayed through some kind of incentive payment (see below).
Forest Protection (REDD+)	Costs depend entirely on the agents and drivers of deforestation and may include the cost of improved agricultural techniques and inputs, policy changes, legal enforcement, etc., and alternative livelihood activities (considered separately in the Appendix as well as the Community Engagement Guidance of this series).
Planting / Establishment (for AR)	Nursery, planting, weed control, fertilizers, fencing, etc.
Materials, Infrastructure	Equipment, appropriate access to the site, etc.
Alternative Livelihood Programs	Often required also for mitigation of leakage if baseline activities of local agents are affected.
Community Engagement	The need for additional on-the-ground presence for on-going community engagement is frequently underestimated.
Government Benefit-Sharing	Carbon benefits may need to be split with local or national governments. This may be considered a transaction cost (tax) or simply a way of recognizing the role of policy makers in the long-term success of the project.
Monitoring	Monitoring of carbon stock may include acquisition and analysis of satellite imagery, overflights, and forest inventories (according to methodology and monitoring plan). Social and biodiversity monitoring is especially important in projects that have obtained CCB validation. Per-hectare costs for monitoring are highly variable.
Miscellaneous / Discretionary / Contingency	See Section 5.5 on project risks.

Where there are multiple revenue streams from the forest enterprise, implementation costs for each stream may need to be analyzed separately, with certain general costs being allocated across the various products generated. Among other reasons, this may be useful in comparing the IRR with and without carbon payments, measures often required as part of the financial tests for carbon additionality (see AR Guidance for a discussion of demonstrating additionality).

Opportunity Costs, Land-Use Incentives, and Benefit-Sharing

All forest carbon projects involve some modification of land use, often involving a shift from a less sustainable to a more sustainable forest or farming system, and sometimes a more radical change in livelihood or land use. Opportunity cost refers to the net income (including the value of home-consumed production) of the baseline activity replaced by or lost due to the project by communities, farmers, or other stakeholders. For example, a REDD project might cause a loss of income for ranchers and farmers accustomed to clearing forests for agriculture.

*An effective land-use incentives strategy requires an understanding of **opportunity costs.***

Opportunity costs are not a project cash flow, but any payments made to defray opportunity costs are.

The proposed land-use strategy in a forest carbon project may encounter resistance if it generates a return less than the opportunity cost of the land users. A sound incentive strategy may even include a reasonable profit margin—a payment beyond the value of the opportunity cost—for land users. However, forest carbon payments may be less than the opportunity costs if the project also yields intrinsic benefits of value to land owners and users, such as secure tenure or land-use rights.

Opportunity costs are not cash expenditures for the project, so they do not appear in cash flow projections. However, estimating opportunity cost to local land users is fundamental to the assessment of overall project viability and to the design of benefit-sharing arrangements, including land-use incentive strategies. The benefit sharing arrangements are, of course, part of the project's cash flow. Brief guidance on evaluating opportunity costs is included as an appendix to this chapter. For a more thorough treatment, see White and Minang (2011).

5.3 Market Transaction Costs

The final cost category involves transaction costs and fees associated with the sale of carbon credits. Common cost factors are noted in Table 5.

Table 5. Typical Transaction Costs for Certification and Sales

Selling and Related Transactions	Observations
Verification (Carbon)	US $30,000- 50,000 per verification event, at least once every 5 years. More frequent verifications can generate revenues sooner, if expected GHG benefits make the expense worthwhile.
Verification (Social/Biodiversity)	CCB certification: Similar to carbon verification costs if performed separately, but may be reduced significantly if timed to coincide with carbon verification.
Registry Fee	For CDM, US$ 0.10-$0.20 per tonne of expected annual average emissions reductions, with exemption for small-scale projects. For VCS, US $0.03 to 0.08/VCU, depending on the registry services required. Additional fees apply for transfers between registry accounts.
Issuance Levy	For CDM, US $0.10-$0.20 per CER, depending on project volume. For VCS, US $0.10/VCU issued .
Brokerage Fee	3-10% of credits sold (if a broker is engaged at all), depending on the range of services provided.
Taxes and Regulatory Fees	Transaction fees imposed by the government that are not already included as "benefit sharing" (implementation costs). See the Legal Guidance for further guidance.

5.4 Bridging the Financial Gap

Forest carbon projects can take several years and hundreds of thousands of dollars to develop. Early implementation costs can be even greater, and it may be several more years before any GHG benefits are generated and verified. Buyers generally prefer to pay for carbon credits once they are issued. This can lead to long periods during which the project is a net consumer of cash, a widespread hurdle for forest carbon projects to date.

5.4.1 Two Types of Funding Gaps

Financing shortfalls can be divided into two categories:

1) **Total costs exceed total revenues over the project lifetime**. When the present value of carbon revenues are insufficient to cover total present value of project costs, the possible solutions can be fairly stark:

    - *Raise new revenues*. Who is benefiting from the forest's diverse product line? Does the project create a public good? Additional grant funds or public support may be "justified" and especially attractive if carbon revenues can cover ongoing costs after initial investments are made.
    - *Reduce costs*. Which project elements are truly essential, and how can these, realistically, be obtained at reduced cost? Can stakeholders be motivated by something other than financial incentives?
    - *Restructure the project*. Is there an entirely different way to achieve the GHG benefits?
    - *Terminate the project*. Sometimes, the decision to terminate a project motivates stakeholders to identify more creative solutions, or can focus resources and attention on more promising alternative project opportunities. If overly optimistic assumptions are required to make the project appear viable, it probably is not.

2) **Costs exceed revenues in the short run, but this situation is reversed thereafter.** This is a classic financing problem, and there are many possible financial arrangements to "bridge" the gap. An essential precondition for private financing is that the excess revenues in future years are sufficiently high to reward investors for taking risk.

    Unfortunately, many forestry projects have proven to be unattractive to investors because returns are too low or too uncertain. The financing gap is especially large for AR projects, which often feature large up-front establishment costs and low rates of carbon sequestration in early years.[13] Any project creating revenues after long delays faces an enormous hurdle: for example, to earn a 10% return with revenues created after 15 years a project would have to generate more than 4 dollars for every dollar invested.

    Having a low or even negative return does not necessarily make a project non-viable; it simply means that it is not a candidate for exclusively commercial financing. Some additional public or charitable support is needed to make it financially viable. See Section 5.5 for perspective on what constitutes a "sufficiently high" return for investors.

[13] It may take 3-10 years for AR projects to even compensate for project emissions (e.g., removal of pre-project vegetation) and leakage (Merger 2010).

5.4.2 Financing Options to Bridge Funding Gaps

Although most buyers prefer to pay on delivery of carbon credits, several buyers are willing to help close the financial gap, and within the industry a few common solutions have evolved for that purpose.[14] The following scenarios could involve carbon buyers as investors or other types of investors that find their risks adequately rewarded by potential future returns.

- **Pay up-front for project development activities.** A rather simple solution is to engage in forward purchases of carbon credits and pay for the project development costs and/or a portion of the purchase price up-front. The specific allocation of risks is dictated by the ERPA (see Legal Guidance). The purchase price will be discounted to reflect the risks assumed by the buyer and the time lag to expected delivery.
- **Pay up-front for purchase options.** A considerable number of forest carbon buyers may be willing to pay a relatively small price up front for the right (not the obligation) to buy carbon credits in the future at a pre-negotiated "strike" price. The advantage to the seller is that the option fee is earned income that can be used to finance project development and implementation. The advantage to the buyer is that for a relatively small up-front cost, a future supply of carbon credits can be secured with some protection against dramatic price increases. Option fees are generally priced according to market volatility and the duration of the option contract: the higher the market volatility and the longer the period, the higher the price. Any risk of non-delivery will have to be factored in the option fee or in the strike price.

  A variation on the option theme is to index the strike price to some market indicator or combination of indicators, such as the price of carbon in the EU ETS.
- **Direct investment with potential to receive future payments in the form of carbon offsets.** This is a fairly common modality for obtaining carbon finance.

  Dutch agricultural lender Rabobank, for example, dedicated a pool of funding for native species reforestation of riparian buffer zones on ranch properties in the Brazilian Amazon and agreed to accept the rights to any eventual carbon credits in exchange.[15]
- **Direct investment with the potential for revenue sharing from offset sales.** In this variation, the carbon credits are sold by the project and the investor instead receives cash. Direct investment could involve a relatively simple agreement between the investor and the project holder, or the creation of a legal entity, or "special purpose vehicle" with ownership shared between the investor, project holder, and possibly other stakeholders. This form of project participation also may allow investors to benefit from project revenues other than carbon, such as timber, tourism, and non-timber forest products. It may also be structured to allow the buyer/investor some control over project activities. Direct investments with revenue sharing require compatible partners and very deliberate effort to maintain the relationship.
- **Invest through a fund that pools many projects.** Rather than trying to master all of the details and complexity of direct project investments, some forest carbon investors may opt to invest in professionally-managed funds along with other investors and buyers. The fund would in turn utilize one or more of the above financing modalities to invest in projects.

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[14] See (Neef, et al. 2010) for a breakdown of solutions favored by market respondents.

[15] This example may appear at first blush to be a common bank loan, but the fact that Rabobank receives payment in carbon benefits instead of cash introduces significant risks, and the pure economics of planting costs do not appear to work out in Rabobank's favor. However, Rabobank may be able to tap external guarantees or subsidies, or perhaps the project serves Rabobank's strategic interest in expanding its traditional lending business to ranchers and soy farmers in the region.

- **Bank lending** for forest carbon projects is still uncommon (but may be available for underlying activities, such as commercial plantations). Financial institutions in developing countries tend to be rather conservative and typically do not engage in project-based lending. A bank might, however, step in if (a) the bank has a strategic interest in the project; (b) a project partner can provide financial guarantees, or is willing to pledge the land or other assets (such as timber) as collateral; or (c) a bank guarantee can be secured from a third party.

Box 2. Key External Guidance on Financing Forest Carbon Projects

Chenost, Clément, Yves-Marie Gardette, Julien Demenois, Nicolas Grondard, Martin Perrier, and Matthieu Wemaere. *Bringing Forest Carbon Projects to the Market.* ONF International, 2010. Available at: http://www.unep.fr/energy/activities/forest_carbon/pdf/Guidebook%20English%20Final%2019-5-2010%20high%20res.pdf

> *This 165-page manual, available in English, Spanish, and French, focuses almost entirely on business and financial aspects of forest carbon project development, with five case studies.*

EcoSecurities and UNEP. *Guidebook to Financing CDM Projects.* Roskilde, Denmark: UNEP CD4CDM, 2007. Available at: http://www.cd4cdm.org/Publications/FinanceCDMprojectsGuidebook.pdf.

> *Though written for CDM project developers, this guidebook has very thorough sections on risk and financing options that apply to projects aimed at voluntary markets as well as CDM.*

PricewaterhouseCoopers and World Council for Sustainable Development. "Sustainable Forest Finance Toolkit." PricewaterhouseCoopers. Available at: http://www.pwc.co.uk/pdf/forest_finance_toolkit.pdf.

> *A resource for financial institutions considering forest carbon investments, including a list of due diligence questions financial institutions are likely to ask about forest carbon projects.*

World Bank. *10 Years of Experience in Carbon Finance: Insights from working with the Kyoto Mechanisms.* Washington, DC: World Bank, 2010. Available at: http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/10_Years_of_Experience_in_CF_August_2010.pdf.

> *The World Bank Carbon Finance group reveals its lessons learned from financing carbon projects around the world.*

BioCarbon Fund. *BioCarbon Fund Experience: Insights from Afforestation and Reforestation Clean Development Mechanism Projects.* Washington, DC: World Bank Carbon Finance Unit, 2011 (forthcoming). The executive summary has been published and is available at: http://wbcarbonfinance.org/docs/57853_ExecSumm_Final.pdf.

> *Similar to the previous reference, this document highlights valuable lessons learned from the BioCarbon Fund's portfolio of AR projects.*

Ascui, Francisco, and Pedro Moura Costa. "CER Pricing and Risk." In *Equal Exchange: Determining a Fair Price for Carbon*, edited by Glenn Hodes and Sami Kamel. Riskolde, Denmark: UNEP CD4CDM, 2007. Available at: http://www.cd4cdm.org/Publications/Perspectives/FairPriceCarbon.pdf

> *A more complete resource on the relationship between risk and carbon price by experts at EcoSecurities, Ascui and Moura Costa.*

5.5 The Cost of Financing: Risk Appraisal and Discount Rates

Regardless of its source, whether from the buyer, the project developer, or a third-party investor, financing will come at a cost. This cost is fundamentally linked to the riskiness of the project.

In the same way as buyers and investors discount the prices paid for carbon credits according to the risk and time associated with the eventual delivery, the stream of cash flows associated with investment in a project needs to be discounted in a project's financial appraisal. A discount rate that reflects this risk and return profile is applied to future cash flows in order to determine their present value. The selection of the proper discount rate is critical to evaluating the feasibility of any kind of project, because it assumes a great deal about how investors – including the project proponent –value future cash flows. The higher the discount rate, the less value is assigned to future revenue cash flows.

Whereas commercial forestry operations in developed nations are considered relatively low-risk investments (trees and land values grow in fairly predictable ways over the long term), pre-validation forest carbon projects are considered high-risk enterprises due to market volatility, regulatory uncertainty, and the general lack of experienced market participants.

Discount rates are typically based on the cost of capital of an enterprise, which in turn is based mainly on its riskiness. The discount rate is regarded as the required rate of return, or "hurdle rate". The higher the risk is, the higher the required rate of return (discount rate). If a project does not offer the required rate of return based on its evaluation of risk, the firm simply will not invest. Conversely, if the risks are high but the prospective profits are higher, the investor will finance the project but extract a large share of those profits if the project is successful. When assessing the value of forest carbon projects for potential investors, then, proponents of projects with higher risk profiles should apply a generous discount rate in order to reflect the *de facto* considerations of investors (keeping in mind that forest carbon markets are *per se* already a risky field of investment).

The relationship between discount rates and risk is well-illustrated by a review of these rates across sectors and economies. Private enterprises with stable, predictable income in stable, low-inflation economies might discount future cash flows at a rate of 12%, with moderate risk at 18 to 24%, and with high risk frequently at over 50%. In relatively unstable economies, discount rates would be higher to accommodate the risk of doing business in those countries. The discount rates generally assumed by economists for subsistence farmers is also relatively high (often 25% to 100%), reflecting limited access to credit and the high risk of crop failure. A 100% discount rate means that in order to venture her own money, the farmer must have a reasonable prospect of doubling her investment in one year.

Governments, which have predictable revenues through taxes, have a lower cost of capital, and therefore typically use discount rates in the 4 to 8% range.

Commercial forestry operations in developed nations are considered relatively low-risk investments (trees, timber and land values grow in fairly predictable ways over the long term). In contrast, forest carbon projects, especially prior to validation, are considered high-risk enterprises due to market volatility, regulatory uncertainty, and the general lack of experienced market participants. In developing countries, political factors often add considerable host-country risks, and project performance risks may be considerable (e.g., fire risks in plantations, uncertain outcomes of agricultural extension activities in REDD+ projects). The response of investors to forest carbon projects without other significant revenue streams suggests these carry implicit discount rates in the 50 to 100% range.

So What Is a Project Proponent to Do?

The practical implication of a very high discount rate is that private sector financing for forest carbon projects will frequently not be available today. While that may be discouraging, it should cause project proponents and developers either to identify or develop projects that require minimal upfront investment, or to find ways of reducing risk and/or increasing returns. Viable projects may have:

- Multiple revenue streams, including some that generate early returns;
- Short lead times to positive cash flow;
- Access to timely and high quality information and analysis needed for project design and development; and
- Immediate, strategic value (i.e., not focused on direct monetary returns) to a prospective project sponsor (corporate, governmental, or NGO).

5.6 Risk Management

The implication for project development is clear: *risk is the enemy of private project financing and project viability.* Investors go to great lengths to understand and reduce risks, and *so should project proponents*. To assess risks, it is helpful to consider the different kinds of risks that a project may be exposed to and the measures that can be taken to mitigate them. Experience to date shows that many proponents of forest carbon projects have suffered from inadequate risk appraisal and response strategies in most categories listed in Table 6. A more in-depth guide for risk assessment and other elements of financial analysis is provided in EcoSecurities and UNEP's *Guidebook to Financing CDM Projects* (see Box 2).

Table 6. Project Development Risks and Mitigation Options

Risk Category	Specific Risk Examples	Risk Management Options
Legal / Regulatory	- Contested rights to carbon assets - Inability to secure DNA or other regulatory approval - Inability to secure permission to sell credits (carbon transfer rights) - Inability to execute land-use agreements	- Thorough legal due diligence and communication with regulatory agencies. - Please refer to the Legal Guidance for additional perspective on legal and regulatory risks.
Political / Sovereign	- Precipitous change in government (election, coup d'état) - Civil unrest - Corruption	- Government-backed insurance (e.g., OPIC, KfW)
Enterprise Performance	- Sudden change or unavailability of key personnel - Logistical delays, protracted negotiations - Failure to secure non-carbon revenues (e.g., timber) - Inability to obtain complete financing - Financial distress, downsizing or "refocusing" of priorities by any of the implementing partners	- Rigorous feasibility assessment - Careful selection of project/enterprise managers and partners - Credible and enforceable performance guarantees by project developers, contractors, and other stakeholders - Cost controls - Early buyer commitment

Carbon Project Performance	- Seedling mortality or the growth rate of trees worse than expected. - Ineffective REDD strategy due to inadequacy in controlling true causes of deforestation - Unavailability of appropriate approved methodology - Incentives may prove not to be sufficient to compensate (perceived) opportunity costs - Faulty or insufficient data - Validation delays or failure - Illegal / unauthorized use of the land in contravention of project objectives - Antagonism or lack of involvement of local communities.	- Conservative projection of carbon credit production - Adequate contingency planning - Implementing pilot activities to test assumptions in the project design - Selecting an experienced and capable project development and implementation team - Well-targeted and effective community consultation and engagement - Careful and timely selection of auditor for validation and verification. - Rigorous documentation of monitoring results - Credible and enforceable performance guarantees by project developers, contractors, and other stakeholders
Market Risk	- Low demand for any of the project's products (carbon credits or others), leading to lower prices or unsold inventory, due to: - Product misalignment with market requirements - Setbacks or failure to agree on future international climate regime; carbon market framework; integration of forestry sector in this framework – with implications also for voluntary and pre-compliance markets - Market saturation from competing projects	- Thorough research to anticipate trends in market expectations - Selection of rigorous standard, and flexibility to switch standards - Careful selection of and coordination with broker or other intermediary - Early buyer commitments - Diversification of project revenue streams to hedge market sector risks - ERPAs covering future credit streams with fixed prices (or price floors)

Risks related to the carbon project cycle (the formal steps to credit issuance) are considered very high prior to Project Design Document (PDD) validation, and moderately high between validation and verification of emissions reductions (see Table 2).

On top of these, buyers need to pay attention to *reputational risk* that could arise from conflicts among stakeholders or negative and unmitigated social/environmental impacts. This is particularly true for voluntary market buyers engaging for CSR and public relations benefits.

Some risks can be reduced, mitigated, or virtually eliminated by proper planning and management. Others can be shared with other parties that are better able to manage them, or transferred by means of insurance.

Unfortunately, some risks of a systemic nature (i.e., market and regulatory risks) cannot be avoided or mitigated at the project level. For example, project proponents and developers may have little say if a government decides that its actions are responsible for reducing deforestation, and therefore it should be fully compensated for some or all of the project's benefits. And there is little one can do about volatility in carbon markets.

A Note about Risk Buffers

Some carbon accounting standards, most notably the VCS, require a portion of issued credits to be maintained as a buffer against unplanned reversals of emissions reductions that have already been verified. However, this mechanism does not address the host of project risks that can reduce the number of carbon credits generated or lead to project failure. Therefore, such risk buffers have no bearing on the cost of financing a project; they are simply intended to protect the integrity of carbon credits once they are issued and used to offset other emissions.

Box 3. Tools for Assessing Forest Carbon Project Finances

GFA ENVEST. *Carbon Revenue Tool.* QUEST JiFor Program. Available at: http://quest.bris.ac.uk/JIFor/resources/C_revenue_tool.html.

> *This tool aims to facilitate the choice between tCERs, lCERs, and VCUs as potential assets a forest carbon project could generate, based on their potential to generate project revenues.*

ENCOFOR. *Economic Module.* Available at: http://www.joanneum.at/encofor/tools/tool_demonstration/Economic_Module_PIN.html.

> *This suite contains an economic module for use in forest carbon feasibility assessments, in addition to written guides to support financial, additionality, social, and environmental impact, and other compliance topics within the CDM A/R framework.*

CCBA and SOCIAL CARBON®. *REDD Financial Feasibility Tool.* Available at: http://www.climate-standards.org/projects/redd.html

> *The CCBA, together with SOCIALCARBON®, has developed a tool for evaluating the financial feasibility of REDD projects.*

BioCarbon Fund and CATIE. *Tool for Afforestation and Reforestation Approved Methodologies (TARAM)*. Available at: http://wbcarbonfinance.org/Router.cfm?Page=DocLib&CatalogID=49187.

> *This tool has been developed to assess project feasibility under different AR methodologies, though it is not up to date for recent methodologies.*

6. Concluding Remarks

Throughout human history, forests have often been viewed either as a practically endless economic resource to be exploited, or as a disposable cover for land to be developed for agriculture or some other "higher and better" use. However, as the world's forests have dwindled and come under threat, their value is becoming clearer, and societies are beginning to assign economic value to standing, healthy forest ecosystems.

More than two decades after the first forest carbon transactions were recorded, we are still learning how to do it, and the values currently assigned for carbon sequestration and storage in forests are in most cases lower than the economic incentives for cutting up and clearing forests.

Nevertheless, the market for forest carbon credits continues to grow as carbon revenues tip the balance in favor of reforestation or forest conservation over ever wider landscapes. Forest carbon is emerging as an asset class and investment opportunity.

As with any economic activity, good planning and good execution are critical for obtaining carbon-related revenues, whether through public expenditures or private markets. Being very conservative about assumptions and taking practical measures to manage carbon product design, volume, pricing, transaction costs, project performance, and risk, forest carbon project proponents can focus their energies on viable activities and attract the investment needed to deliver cost-effective, verifiable emission reductions.

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Appendix: Estimating Opportunity Costs

A proposed change in land-use strategy may encounter resistance if it generates a return less than the opportunity cost of the land users. Some kind of carbon benefit-sharing mechanism may therefore be required to ensure the project's long-term viability.

Benefit sharing can be divided into two components:

- The minimum cost of an incentives strategy sufficient to persuade farmers/communities to engage: possibly a combination of a cash payment and community in-kind benefits;[16] and
- Additional payments or benefits to farmers/communities from any remaining "net profits" generated by the project.

The main purpose of estimating land-use opportunity costs is to help design the project's land-use incentives strategy. A sequential two-stage approach is proposed to explore this theme.

Participatory and Qualitative Opportunity Cost Analysis

Before embarking on opportunity cost analysis, it is necessary to identify (a) the most important baseline project land uses to be compared and (b) stakeholder groups, including, for example, community sub-groups and agro-industry. These groups can then be engaged in a qualitative assessment of the perceived costs and benefits arising from the proposed project.

For a community-focused assessment, the following process can generally yield useful insights:

- Use participatory research methods.
- Ask stakeholders to consider and rank the whole range of benefits and costs (or disadvantages) of their current land use (economic, ecological, social, etc.). Ranking can be done using an intuitive exercise such as stone piling.
- Ask stakeholders to consider the proposed project land use and how they think it will affect the level of benefits and costs they have identified from the baseline land use, along with the risks associated with the proposed change.

Such an exercise would be very rough, but can help triangulate project assumptions and economic calculations, provided that it is based on balanced information. Its effectiveness will also depend on the extent to which the stakeholders understand the benefits and costs of the proposed project land-use strategy (this is likely to depend on their experience with the proposed project land use). For more on this aspect of project development, readers may consult the Community Engagement Guidance of this series.

A rapid qualitative analysis will help decide if a quantitative economic analysis is really essential. This is often the case where there are significant trade-offs involved.

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[16] This is a strategy successfully employed by the Juma REDD project, http://www.fas-amazonas.org/en/secao/juma-redd-project. In a national REDD+ program scenario, it is possible that a "with program" land-use incentives strategy could be based mainly on a policy reform that leads to future income potential (e.g., a change of tree tenure giving communities and farmers greater rights over timber and non-timber forest products) and, thus, would not require a cash payment at all. Depending on the national context, increased tenure security and/or improved governance can be more powerful drivers of land use change than any cash payments.

Quantitative Economic Comparison of Land Uses

Some general principles and guidance for estimating land-use opportunity costs associated with the proposed project are as follows:

- In most situations a "discounted cash flow" analysis is needed from the perspective of the relevant stakeholders since alternative land uses have costs and revenue (production) occurring at different points of time.
- Agricultural or forestry production needs to be modeled over time, taking into account expected changes in resource productivity. The production value must include any subsistence production as well as cash sales.
- Economic calculations are sensitive to the prices used, which can vary hugely by season, affecting revenues as well as costs. Home consumed production theoretically has a higher unit (opportunity cost) value than sold produce.
- Family labor cost should be based on its opportunity cost value, which also varies by season.
- A basic discounted cash flow calculation for comparing land uses is Net Present Value (NPV) *per hectare*, or NPV per day of labor if labor is a more important production constraint. When capital or credit is scarce, as it normally is, the Internal Rate of Return is important; it shows the return on capital or money invested in the production system, and can be compared to what farmers/communities could earn from the best alternative investment available to them.
- A sensitivity analysis is vital, running the analysis with different assumptions about key variables (discount rates, producer prices, labor costs, etc.) to see how they affect the outcomes.

An opportunity cost or economic land-use comparison is not as easy and quick as it may appear. Getting the economic calculations wrong can be worse than not doing them at all if conflicts arise between unintended "winners" and "losers" during project implementation. Further, reliable interpretation of opportunity costs depends on having a sound understanding of how farmers' decisions are affected by their perceptions of resource endowments, scarcity, and risk. The analysis should be undertaken by a resource economist who fully understands socio-economic dynamics at work in local land-use decisions.

Limitations of Opportunity Cost Analysis

There are some limitations to opportunity cost and comparative land-use analyses:[17]

- When the baseline land use is illegal the cost of legal enforcement or compliance is probably a better measure if this is the proposed project activity. However, care needs to be taken to mitigate negative equity impacts (since the poor are often most dependent on illegal resource degrading activities, see Social Impacts Guidance). On the other hand, supporting sustainable alternative livelihoods for community members involved in illegal logging, for example, is a prudent project strategy. In this case, it is important to note that net income from the proposed project livelihood only needs to be sufficient to encourage participation and avoid increasing poverty: it does not have to be comparable to the foregone illegal earnings. The analysis should also take into account the costs incurred by baseline actors of operating outside the law (e.g., bribery expense, higher risk, etc.).

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[17] See Gregersen, et al. (2010).

- Differences between estimated and perceived opportunity costs (which depend on how people sub-consciously value non-tangible benefits and costs, and their attitude to risk) also complicates the analysis. It is difficult to be accurate and precise in these calculations, and actual land-use decisions will ultimately depend on perceived project net benefits.

Finally, opportunity cost analysis will not provide all the information necessary to design an effective project-based land-use incentives strategy because:

- If poverty alleviation is an explicit project aim, an approach to community benefits driven only by opportunity cost plus a normal return may be an inappropriate measure for designing incentives.
- If current land uses are driven by prevailing policy and governance failures, cash and in-kind incentives may prove ineffective in ensuring local stakeholders adopt the preferred proposed project land uses.
- It can be argued on equity grounds that communities as well as project developers and investors should benefit from potentially higher future carbon prices.

Project proponents and developers must find ways of addressing these limitations, either by internalizing such complex issues within the opportunity cost analysis, or by weighing calculated opportunity costs in the context of these considerations.

Glossary

For CDM projects, readers may wish to refer to the official definitions provided in the CDM Glossary of Terms, available at: http://cdm.unfccc.int/Reference/Guidclarif/glos_CDM.pdf.

VCS also provides standard Program Definitions, which are available at:
http://www.v-c-s.org/sites/v-c-s.org/files/Program%20Definitions%2C%20v3.0.pdf.

Additionality – The principle of carbon additionality is that a carbon project should only be able to earn credits if the GHG benefits would not have occurred without the revenue (or expected revenue) of carbon credits. The same principle of additionality can be applied to social and biodiversity benefits.

Attribution – The isolation and accurate estimation of the particular contribution of an intervention to an outcome, demonstrating that causality runs from the intervention to the outcome. That is, attribution demonstrates that benefits claimed by the project (usually *co-benefits*) have been caused by the project and not another phenomenon.

Baseline – See *reference scenario*.

Biodiversity target – Biodiversity features which the project will target in its efforts to achieve net positive impacts on biodiversity. These will usually comprise High Conservation Values.

Causal model – See *theory of change*.

Co-benefits – Benefits generated by a forest carbon project beyond GHG benefits, especially those relating to social, economic, and biodiversity impacts.

Control – In the context of impact assessment for forest carbon projects, an area that does not experience project interventions but is otherwise similar to the project area. Controls are used to monitor the reference scenario and to demonstrate the attribution of outcomes and impacts to the project.

Counterfactual – The outcome that would have happened had there been no intervention or project – i.e., the final outcome of the reference scenario.

Evaluation –The systematic and objective assessment of an on-going or completed project, program or policy, and its design, implementation, and results.

GHG benefits – Any emissions reductions from reducing carbon losses or emission removals from enhanced carbon sequestration due to the forest carbon project activities.

Impact – The positive and negative, primary and secondary, short- and long-term effects of a forest carbon project. Impacts may be direct or indirect, intended or unintended. Impacts result from a chain of inputs, outputs, and outcomes.

Indicator – A measurable variable that reflects, to some degree, a specific monitoring information need, such as the status of a target, change in a threat, or progress toward an objective.

Inputs – The financial, human, and material resources used for a forest carbon project. Most relevant in discussion of outputs, outcomes, and impacts.

Leakage – The geographical displacement of GHG emissions – or social, economic, or biodiversity impacts – that occurs as a result of a forest carbon project outside of the forest carbon area. Leakage assessments must consider adjacent areas as well as areas outside of the project zone.

Measurement, Reporting, and Verification System – A national, subnational, or project-level set of processes and institutions that ensure reliable assessment of GHG benefits associated with real and measurable emission reductions and enhancement of carbon stocks.

Methodology – An approved set of procedures for describing project activities and estimating and monitoring GHG emissions.

Monitoring – A continuing process that uses systematic collection of data on specified indicators to provide indications of the extent to which objectives are being achieved.

Multiple-benefit projects – Projects that generate sufficient environmental and social co-benefits, in addition to GHG benefits.

Outcomes – The likely or achieved short-term and medium-term effects of an intervention's *outputs*.

Outputs – The products, capital goods, and services that result from a forest carbon project.

Project area – The land within the carbon project boundary and under the control of the project proponent. (The CCB Standards use distinct language for *project area* and *project zone*.)

Project developer – The individual or organization responsible for the technical development of the project, including the development of the PDD, the assessment of social and biodiversity impacts, monitoring and evaluation, etc. Although the term does not necessarily describe a commercial entity, it often refers to an external company that is contracted to do work on the ground.

Project Design Document – A precise project description that serves as the basis of project evaluation by a carbon standard, commonly abbreviated to PDD. (Alternatively, VCS calls this the "project description," or PD)

Project participant – Under the CDM, a Party (national government) or an entity (public and/or private) authorized by a Party to participate in the CDM, with exclusive rights to determine the distribution of CERs – equivalent to *project proponent* under the VCS. In the voluntary market, project participant is used more loosely to describe any individual or organization directly involved in project implementation.

Project proponent – A legal entity under the VCS defined as the "individual or organization that has overall control and responsibility for the project." There may be more than one project proponent for a given project. Carbon aggregators and buyers cannot be project proponents unless they have the right to all credits to be generated from a project.

Project zone – The project area plus adjacent land, within the boundaries of adjacent communities, which may be affected by the project. (The CCB Standards use distinct language for *project area* and *project zone*.)

REDD – A system that creates incentives and allocates emissions reductions from reducing emissions from deforestation and forest degradation.

REDD+ – A system that creates incentives and allocates emissions reductions from the following activities: (a) reducing emissions from deforestation; (b) reducing emissions from forest degradation; (c) conservation of forest carbon stocks; (d) sustainable management of forests; and (e) enhancement of forest carbon stocks.

Reference scenario – An estimated prediction of what will happen in a given area without the project. Reference scenarios may cover land use patterns, forest conditions, social conditions, and/or biodiversity characteristics. Also called the "business-as-usual scenario" and the "baseline."

Starting conditions – The conditions at the beginning of a project intervention. Also called "original conditions" in the CCB Standards and sometimes referred to as the "baseline" in the field of impact assessment. This can, however, lead to confusion, considering that CCB Standards and carbon standards use the same term to describe the "reference scenario" of a forest carbon project.

Theory of change – The hypothesis, as developed by the project design team, of how the project aims to achieve its intended goals and objectives, including social and biodiversity objectives. This is sometimes referred to as the *causal model.*

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