6.1 Introduction

Carbon finance encourages climate change mitigation by providing additional revenues to low-carbon activities in Afforestation and Reforestation (A/R) and several other Clean Development Mechanism (CDM) sectors. CDM projects produce emission reductions that can be sold in the carbon market to generate “carbon” revenues. Because of the non-permanence rule, the emission reductions achieved by A/R projects are considered temporal; consequently, these projects produce temporary Certified Emission Reductions (CERs), which in turn have consequences on projects’ finance.

The BioCF experience suggests that the CDM has had little effect on overcoming the disproportionately large investment barriers A/R projects face in most developing countries. The reasons for this include: (i) as trees grow slowly, projects produce low volumes of emission reductions; (ii) the length of Emission Reductions Purchase Agreement (ERPA) contracts is usually short, reflecting the uncertainty associated with the continuation of the Kyoto Protocol; (iii) the transaction costs of meeting the CDM requirements are usually high due to local stakeholders’ limited capacity for project development and implementation; (iv) the United Nations Framework Convention on Climate Change’s (UNFCCC) approach to non-permanence leads to low-priced forestry credits and limits their demand; and (v) unpredictable carbon revenues due to the long approval process associated with carbon certification. Furthermore, leveraging financing has not been an easy task. Financing institutions and banks do not understand carbon finance or perceive it as highly risky; in countries with unfavorable business environments, scaling up A/R CDM is an even-greater challenge.
Reforms are needed to scale up the A/R CDM. From the finance perspective, urgent reforms include developing innovative approaches to non-permanence, creating rules specially tailored for developing countries (to reduce transaction costs), and increasing the limits on emission reductions for small-scale projects. In addition to changes to the rules, innovative instruments are needed to facilitate projects’ access to frontloaded financing, such as policy measures (e.g., national budget allocations) and concessional finance.

This chapter presents the BioCF experience testing carbon finance in different types of forest projects. Section 6.2 explores the role of CDM in catalyzing underlying investment in projects. Section 6.3 analyzes the relevance of carbon finance in the A/R sector. Section 6.4 summarizes recommendations for improvements.

CDM Catalyzing Investment for Afforestation and Reforestation

The CDM has played a role in catalyzing underlying investment in A/R projects from different sources. In the BioCF, about $227 million of underlying investment will benefit from CDM ERPA contracts, if projects are implemented as expected. The BioCF has contracted over nine million tCO₂e from 21 A/R CDM projects since 2005 through over $30 million in contract values. The leverage factor is 1:7, reflecting the amount of investment that was catalyzed by each dollar of carbon finance in order to make projects achievable. Fifty percent of the underlying investment is from private sources, 47 percent from public sources, and three percent from nonprofit organizations (Figure 6.1).

**FIGURE 6.1 SOURCES OF UNDERLYING INVESTMENT IN THE BIOCF PORTFOLIO**

<table>
<thead>
<tr>
<th>Source</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public investment</td>
<td>47%</td>
</tr>
<tr>
<td>Domestic public</td>
<td>37%</td>
</tr>
<tr>
<td>Foreign public</td>
<td>10%</td>
</tr>
<tr>
<td>Domestic private</td>
<td>4%</td>
</tr>
<tr>
<td>Foreign private</td>
<td>8%</td>
</tr>
<tr>
<td>Non-governmental Orgs.</td>
<td>3%</td>
</tr>
</tbody>
</table>

6.2.1 Different Sources of Investment in the BioCF Portfolio

Projects across the BioCF portfolio differ according to the type of investment sources they use and this is closely related to their purpose. Projects in the BioCF portfolio fall into three broad categories according to their investment source: (i) government, public entity, and NGO-led projects, largely supported by public (domestic and foreign) financing; (ii) private sector-led projects mainly supported by domestic private investment, but with some support from foreign private capital; and (iii) public-private initiatives that combine different types and sources of investment.

Carbon finance has played a small role in catalyzing underlying investment in the first two types of projects. Most of the project entities have financed a large portion of the project costs through equity investment; carbon finance has helped them mainly overcome institutional and country risk-related barriers. For example, because of the incentive from carbon finance, some project entities have been able to establish land tenure arrangements with private landowners and communities that facilitate the creation of sound, legally-binding land-use contracts. Carbon finance has also stimulated other projects to test reforestation in countries with higher investment risk compared with business-as-usual places. However, in public-private partnerships, carbon finance has had a major catalytic role. Examples of projects within each group are presented in the sections below.

**Government, Public Entity, and NGO-led Projects**

These projects usually aim to enhance public goods and services\(^1\) and have mainly catalyzed grants

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\(^1\) These projects typically seek to achieve socioeconomic (e.g., improving livelihoods of small- and medium-sized farmers) and environmental (e.g., land restoration, water source protection, forest and wetland restoration, and biodiversity conservation) goals. Since many of these benefits do not have a market value, closing the investment gap is a challenge.
from public foreign sources. The financing models of these projects are simple, with the project entities contributing a large portion of the investment (e.g., 80 percent of equity on average). A few projects in this category have also catalyzed concessional finance. Sixty-two percent of the BioCF portfolio present this type of financing model (see Annex 1). Examples are presented below:

- Projects financed largely by a national government entity using grants from international donors and carbon finance to cover project preparation, implementation, and operating costs (Box 6.1).
- Projects largely supported by a regional government, but raising funding from grants and small amounts from farmers associations and other national institutions. A small variant of this model is the contribution of a small amount of equity investment by a nonprofit organization which was created to be the project entity.
- Projects mostly financed by nonprofit organizations. These projects also rely on grants and use carbon finance to cover maintenance costs and farmers’ compensation for the land-use change.
- Projects relying on financing from foreign financing sources, in the form of grants and loans from multilateral development organizations. Where World Bank concessional loans are available, the carbon sequestration project is a sub-component of a wider project financed through the loan. While the carbon project benefits from the institutional arrangements implemented by the wider project, this also supports the testing of carbon finance as an instrument for improving the performance of A/R projects.

Private Sector-led Projects

The main objective of these projects is commercial (e.g., sale of timber and other products). Most of them, however, also pursue social and biodiversity-related secondary objectives. Private sector-led projects are financed mainly by equity from private forest companies. Twenty-four percent of the BioCF portfolio present this type of financing model. Three types

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Box 6.1

**Financing of the Moldova Soil Conservation Project**

**SOURCES OF FINANCING**

To achieve its objectives, the project developer (Moldsilva) is blending two types of financing to cover the project costs for the first 10 years: (i) $18.74 million from Moldsilva; (ii) and $2 million from two Japanese PHRD grants. The project is expected to receive about $6 million from the sale of emission reductions to two World Bank carbon funds and to the voluntary carbon market.

**FINANCING MECHANISM**

Resources from Moldsilva are being used to cover the costs of forest establishment, operations, and ongoing maintenance. Resources from the Japanese grants have been used to provide alternative livelihoods, develop the capacity of communities involved in the project, help the project improve forest management, promote natural regeneration in areas that were previously destroyed by illegal logging, and improve community pastures. The project started planting in 2001, started receiving payments from the sale of emission reduction credits from the World Bank in 2005, and started receiving revenues from the sale of forest and non-timber products in 2010.

**THE ROLE OF CARBON FINANCE**

Carbon finance helped this project overcome initial investment barriers. Moldsilva was unable to get a loan from a local financial institution. The role of carbon finance in improving the viability of this project is clear, and the benefit is being spread out over 40 years. Without carbon finance the project was not financially viable at Moldova’s 15-percent bank lending rates. Carbon finance motivated the local council to establish legally binding institutional arrangements with Moldsilva and participate in the project.
of private companies can be identified in the BioCF portfolio:

- Private companies with adequate investment capacity and timber as their main product. They plant selected species in high densities on lands with clear property rights that are close to markets. This project entity seeks to use carbon revenues to compensate for country-related risk and other risks stemming from changes to their business-as-usual scenario (e.g., planting on less degraded lands in relatively more stable countries).

- Private companies with adequate investment capacity that incorporate farmers in their timber supply chain. The project entity seeks to use carbon revenues to compensate farmers for the new land use (forestry) and maintain their interest in participating in the project.

- Private companies with adequate investment capacity engaging in forest projects for conservation purposes. Such as afforestation to compensate for forest loss in flooded areas and to improve biodiversity. Carbon finance to finance project maintenance costs).

- Private companies without adequate investment capacity that have created alliances with foreign private companies to secure needed investments. In this case, the contribution from the private companies is contingent on the project achieving CDM validation, and the carbon revenues are used to cover tree maintenance and operation costs.

Public-private Initiatives

6.10 Public-private entities blend investment finance from public and private sources to achieve commercial, social, and environmental objectives. They have catalyzed investment finance from both foreign and domestic sources. There are two types of public-private initiatives in the BioCF portfolio:

- A private company and a regional government involving poor farmers in timber production and land-restoration. The government agency facilitated project financing by securing low-cost loans from commercial local banks and foreign public financing institutions (Box 6.2). In these projects, carbon finance increased the internal rate of return by 5-6 percentage points.

- A private-public project entity created for the purpose of the A/R CDM project to assure participating landholders’ access to difficult-to-access subsidies for afforestation and to promote the participation of private forestry enterprises in the A/R CDM project. Through the participation of these private forest enterprises, the project entity not only ensured a market for the timber produced by the landholders but also guaranteed an attractive and flexible cash flow for farmers.

6.3 Relevance of Carbon Finance in the A/R Sector

6.11 Although some BioCF projects are replicating their first carbon finance experience, the potential to scale up in the A/R CDM is limited and diminishes as 2012 approaches. Replication is happening at a slow pace and only takes place where champion project entities are involved; most projects are still completing their first A/R CDM project. This is true in all CDM sectors, but the A/R projects are at a distinct disadvantage due to the following limiting factors.

6.3.1 Disproportionately Large Investment Barriers

6.12 Forestry sectors in developing countries usually face strong investment barriers. About 90 percent of the BioCF projects confirmed the absence of long-term financing for forestry-type investments from financial institutions in their countries. Most projects were unattractive to private investors because of their poor rates of return on investment and a high perceived risk—particularly due to natural disasters and under-delivery risk associated with unproven technologies (e.g., slow-growing species), unproven business models (e.g., risky counterpart, and highly degraded soils).

6.13 The investment barriers affecting A/R CDM projects also reflect the fact that domestic banks are constrained by the country’s sovereign risk. This limits their access to external funding and is reflected in the commercial conditions they offer to potential borrowers (e.g., high interest rates and fees, short tenors, strong guarantees, collateral requirements, and stringent covenants). Overall, the commercial banks’
conditions and all-in cost of loans do not match projects’ cash flows needs (Kossoy, 2010).

6.14 Project entities’ capacity also plays a role in securing investment. From the financing perspective, managerial, and technical capacity are enabling conditions for securing investment. Some projects with strong potential were delayed in being accepted into the BioCF portfolio because the project entities struggled with closing the financial gap as they lacked the managerial capacity to do so. These delays negatively impacted project implementation and delayed project preparation (and, therefore, credit issuance). In the BioCF experience, the reasons for these delays include low capacity of project entities to meet their financing procedures, administrative lags in disbursement of loans and grants, and political instabilities in a host country preventing timely availability of project finances.

6.3.2 CDM Not Overcoming Investment Barriers

6.15 In the BioCF experience there are three indicators of carbon finance’s low capability to stimulate A/R in developing countries. First, the higher leverage ratio of forest projects relative to projects in other CDM sectors reveals that the incremental carbon finance internal return rate is not substantial (World Bank, 2010a). Second, projects mainly rely on project entities’ equity contribution, exposing developers’
difficulty in mobilizing debt. Third, carbon finance has removed financial barriers to investment in a few cases and carbon revenues only makes a small contribution to projects’ viability. All these factors explain the difficulties of this sector to grow.

6.16 These indicators reveal structural problems with the A/R CDM. The combined effect of complex rules, project developers’ low capacity for project development and implementation, and perception of high risk have led to high transaction costs, low prices of forestry credits, and a limited demand. This is compounded by the fact that these projects deliver low volumes of emission reductions per year and that most countries have unfavorable business environments that prevent projects from frontloading carbon finance to cover the required high upfront investment. In essence, while projects having commercial purposes as a main rationale struggle with complying with additionality, very few projects with environmental and social goals had internal return rates higher than 6-7 percent without carbon. All these issues are discussed in the sections below.

**Low Volumes and Short Contracts**

6.17 A/R CDM projects are highly limited by their low volume of emission reductions. Registered projects expect to reduce on average 40,000 tCO₂e/year, a low value compared with projects in other sectors. (See Figure 6.2. Also refer to Chapter 1.) This value may vary across projects, depending on site natural conditions. In the BioCF portfolio, for example, projects' equity contribution of project entities is on average 80 percent of the total investment. In government, public entities, and nongovernmental organization-led projects grants from multilateral organizations and developed countries as well as concessional loans have been the second most important source of financing for these projects. In private sector-led projects small in-kind contribution from participant farmers, if any, are the most frequent source of investment. Interestingly, projects in other sectors present a reverse split, with roughly a 20–30 percent equity and remainder 70 to 80 percent debt.

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9 The equity contribution of project entities is on average 80 percent of the total investment. In government, public entities, and nongovernmental organization-led projects grants from multilateral organizations and developed countries as well as concessional loans have been the second most important source of financing for these projects. In private sector-led projects small in-kind contribution from participant farmers, if any, are the most frequent source of investment. Interestingly, projects in some other sectors present a reverse split, with roughly a 20–30 percent equity and remainder 70 to 80 percent debt.

10 Carbon finance has contributed to increasing the internal return rate of some projects by 5-6 percent; in most developing countries, reforestation projects are expected to result in internal return rates from 10–12 percent. More examples of this are provided later.

**FIGURE 6.2 EXPECTED AVERAGE ANNUAL EMISSION REDUCTIONS IN DIFFERENT TYPES OF REGISTERED CDM PROJECTS**

Source: CD4CDM
Potential for carbon sequestration ranges from 3 to 23 tCO₂e/ha/year, reflecting variances in types of ecosystems, project areas, forest management, tree species, level of soil degradation, among others. Such variances highlight the relevance of project entities’ objectives in projects’ emission reductions. Projects pursuing environmental purposes usually garner the lowest productivity as they plant slow-growing native species in low densities. Small-scale projects have a built-in revenue ceiling as they cannot exceed 16,000 tonnes of CO₂e per year (Box 6.3). Four out of the 21 BioCF projects are small-scale.¹¹

Projects’ expectations regarding emission reductions may be reduced due to several factors. Some BioCF projects, for example, have delayed their planting for 3 to 4 years because of difficulties in complying with the A/R CDM rules.¹² Land areas can also be reduced due to unforeseen factors (e.g., operational issues, adverse climate conditions). Some projects have reduced their carbon revenue expectations because of overestimation of tree growth at project planning. This problem is frequent in projects planting non-commercial native species due to a lack of information on tree growth rates. But even projects planting well-known species may face overestimation problems when planting on severely degraded lands for the first time; overestimation of carbon credits have occurred in this type of project in spite of a thorough selection of conservative tree growth rates. The BioCF constantly assesses projects’ under-delivery risk and amends ERPA contracts accordingly to produce reasonable estimates of expected contract delivery. So far, a number of ERPA contracts have been amended downwards with projects’ original expectations being reduced by up to 60 percent from the original contracted emission reductions.¹³

In addition to low volume of emission reductions, credit buyers are only willing to enter into short-term credit purchase agreements. This is due to the prevailing uncertainty about a second Kyoto Protocol commitment period. However, BioCF participants have contracted to purchase emission reductions from vintages up to 2017 from most of the projects. With ERPA contracts lasting about eight years, the BioCF is entirely taking on the eligibility risk of post-2012 assets. As a result, other market players less able to run such a risk may offer even shorter ERPA contracts to carbon credit sellers. Although the excess of emission

¹¹ See Section 6.6 for more discussion of small-scale projects.
¹² Projects that are seriously lagging behind their implementation schedule (e.g., 3 to 4 years) are those having poor land tenure registries and located in tropical climates and competitive lands.
¹³ An important reason for ERPA amendments in early projects was difficulties in getting accurate estimations of ex-ante emission reductions. The volume of emission reductions in many of the ERPAs were established based on a percentage of projects’ preliminary emission reductions. The ERPA contracts of some projects have, however, been amended upward, reflecting over-performance and, sometimes, under-estimation of emission reductions.
reductions\(^{14}\) (i.e., emission reductions not contracted with the BioCF) may appear attractive for projects in the long run, not having a longer-term carbon contract is negatively affecting their short-term viability. Poor cash flows increase the non-permanence risk of projects, especially for those expecting to use carbon revenues to cover tree maintenance costs.

6.20 The voluntary carbon market is starting to play a role in projects’ cash flows. As projects advance in the CDM project cycle (e.g., registered projects), they gain the confidence to approach other markets for the sale of future vintages of CERs. This has happened in two BioCF projects, one of which managed to contract emission reductions for a value that represents 20 percent of the funding required for effective project implementation. The voluntary forest carbon markets may open opportunities for the sale of excess emission reductions produced by A/R projects, with the market for REDD+ credits increasing in recent years\(^{15}\).

### High Transaction Costs

6.21 The transaction costs of meeting the A/R CDM requirements are high. Transaction costs include PDD preparation, validation, project registration, monitoring, verification of emission reductions on the ground, and issuance of credits. Table 6.1 illustrates this for the BioCF projects, most of which have completed the first three stages of the cycle. Few projects have gone through verification.

6.22 The wide range in transaction costs mostly reflects differences in project developers’ capacity to comply with the A/R CDM rules and procedures. High preparation costs are evidence of the fact that early projects incurred costs for developing new methodologies\(^{16}\) and that project developers have had to outsource services to specialized international consultants to apply the complex early versions of GHG accounting methodologies. On average, transaction costs\(^{17}\) for small-scale BioCF projects are 30 percent lower than for large-scale projects. This is because small-scale projects are allowed to apply simplified baseline and monitoring methodologies and procedures. The significance of such a reduction, however, has to be analyzed in light of the potential carbon revenues from these projects\(^{18}\).

6.23 Cost variations in validation and verification reflect differences in project sizes and locations, the quality of project documentation, as well as DOEs’ experience in the A/R sector. Validation contracts negotiated in recent years are more costly than early contracts because DOEs have improved their estimations of the workload required for desk reviews and site visits. Cost increases also reflect the increased scrutiny by DOEs to projects since 2009 as a result of the CDM EB’s

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**Table 6.1 TRANSACTION COSTS IN BioCF A/R CDM PROJECTS BY STAGE**

<table>
<thead>
<tr>
<th>Stage of the Project Cycle</th>
<th>Cost US$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Large-scale</td>
</tr>
<tr>
<td>Project Preparation</td>
<td>170,000–400,000</td>
</tr>
<tr>
<td>Validation</td>
<td>16,500–45,000</td>
</tr>
<tr>
<td>Registration Fee(^{a})</td>
<td>16,500–48,000</td>
</tr>
<tr>
<td>Verification</td>
<td>14,300–53,200</td>
</tr>
<tr>
<td><strong>Total(^{b})</strong></td>
<td><strong>217,300–546,200</strong></td>
</tr>
</tbody>
</table>

\(^{a}\) The registration fee for tCERs is calculated based on the difference between the tCERs for which issuance is requested for a given verification period and the highest tCERs previously issued. If this number is positive, the registration fee is $0.10 per the first 15,000 tCERs based on the annual emission reductions produced over the crediting period of a project, plus $0.20 per tCER produced in excess of 15,000 tCO\(_{2}\)e (UNFCCC, 2010b). Small-scale A/R CDM projects do not pay registration fees. (The CDM EB stated in 2010 that no registration fee has to be paid for proposed project activities with expected average annual emission reductions over the crediting period below 15,000 tCO\(_{2}\)e.)

\(^{b}\) The total figure for small-scale projects is still incomplete as none of the four BioCF small-scale projects has gone through the verification process.

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14 Depending on the starting date and length of the crediting period, emission reductions from 9 to 24 years have not been contracted in BioCF projects.

15 Many BioCF projects are contributing to reducing the pressure over primary forests through reforestation, forest restoration, and assisted natural regeneration.

16 The cost of developing a methodology for A/R projects was 15 percent higher than for projects in other CDM sectors, reflecting the need for primary data collection and the scarcity of specialized capacity for methodology development.

17 Including preparation, validation, and registration costs.

18 See Section 6.3.3 for more discussion on the viability of small-scale projects.
**FIGURE 6.3** VARIATION OF VALIDATION COSTS IN CDM PROJECTS DEVELOPED IN THE BioCF

Note: The prices identified in the figure are validation costs incurred by some BioCF A/R CDM projects.

**FIGURE 6.4** PROJECT DEVELOPMENT COST BY TECHNOLOGY ($/tCO₂e)—WEIGHTED AVERAGE

Note: Transaction costs included in this figure are project preparation, validation, and monitoring costs up to July 2011. The figure does not include methodology preparation costs, and it only reflects World Bank costs—excluding other transaction costs incurred by the project entity.
strict evaluation of DOEs’ assessments of projects.¹⁹ Figure 6.3 illustrates the validation costs of projects developed in the World Bank and indicates some costs for validation of A/R projects. The trend lines for both small- and large-scale projects show that the prices for validation have moved upward over time.

6.24 Compared with other sectors, the costs of developing A/R CDM projects rank highest. As shown in Figure 6.4, the average cost per tCO₂e contracted in forest projects exceeds $1.00, higher than the average cost per tCO₂e of carbon for projects in other sectors. These costs could decrease marginally with improved local capacity and the availability of methodologies applicable to the project context. For example, in a second A/R project implemented in China by the same project entity, the preparation costs were about 30 percent lower.

6.25 There are differences across projects when analyzing project development costs per tCO₂e.²⁰ While costs range from $0.40 to $3.70, early projects with low capacity for project development have had the highest cost per tonne.²¹ On the other hand, projects with the lowest cost are those that started their development more recently (e.g., 2009) and therefore are greatly benefiting from CDM EB rule simplifications. These projects also have good capacity for project development and implementation, reflecting the BioCF’s improved project screening process. Projects planting on scattered and disperse areas tend to have high monitoring costs.

6.26 The significance of the transaction costs can be understood when comparing them with the total investment and the expected carbon revenues. While the transaction costs for BioCF projects are on average 6 percent of the total investment, this figure varies widely (from 0.5 to 20 percent) depending upon the project size and total investment. When comparing transaction costs per unit with expected carbon revenues, they are much higher (one-third of the price of emission reductions as opposed to other project types).²²

Low Prices and Low Demand

6.27 Current prices of credits are too low to enhance A/R CDM project’s cash flows. Because of the UNFCCC’s approach to non-permanence, the prices of these credits are lower than prices of credits from projects in other CDM sectors. A/R CDM credits are considered temporary and have a limited useful life. Thus, Kyoto Protocol’s Annex B parties using credits from A/R CDM projects to meet their emission reduction commitments have to replace them with permanent credits before their expiration.²³ Since A/R credits expire in future commitment periods,²⁴ their current price depends on actual and future prices of other Kyoto Protocol’s assets²⁵ as well as on discount rates. To ensure a financially sound transaction, the price of a tCER²⁶ added to the price of a (forward) replacement credit²⁷ should be comparable to the current price of a permanent carbon credit; as a consequence, the BioCF’s price range for emission reductions is $4–5 per ER.

6.28 In addition to the negative effect on prices, the UNFCCC’s approach to non-permanence negatively affects the demand for A/R CDM credits. Temporary credits are not attractive for current cap-and-trade systems because of their lack of fungibility with other Kyoto Protocol’s assets. For example, A/R CDM credits have been banned under the European Union Emissions Trading Scheme (EU-ETS), so far

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¹⁹ DOEs can lose their accreditation if their assessment of projects at validation and verification is not carried out according to the CDM standards.

²⁰ Including only the costs incurred by the World Bank.

²¹ Projects located in tropical climates where the vegetation reach the national CDM forest definition thresholds and with weak land tenure registry systems have the highest transaction costs, reflecting the many efforts they have made to identify appropriate lands and landholders.

²² Transaction costs beyond those of meeting the CDM requirements have to be considered when estimating the cost of sequestering a tonne of CO₂e. These include business development, legal, due diligence, project planning, institutional arrangements, and project management. (See Pagliola et al., 2004, and World Bank, 2011, for more information on methods for calculating the cost of carbon sequestration.)

²³ There are two types of forestry credits: temporary CERs (tCERs) and long-term CERs (lCERs). Annex B parties of the Kyoto Protocol can use them to meet their compliance for the commitment period they were issued. tCERs expire at the end of the commitment period they were issued; lCERs expire at the end of the project’s crediting period.

²⁴ The BioCF pays projects for their annual emission reductions upon validation, receipt of annual reports, and other conditions defined on a project-by-project basis. See Section 6.6.2 for further discussion on this topic.

²⁵ Annex B parties can replace tCERs with assets such as AAUs, CERs, ERU, RMUs, or ICERs. They can replace ICERs with AAUs, CERs, ICERs, ERUs, or RMUs. See Chapter 5 for more discussion on non-permanence.

²⁶ The BioCF’s project entities decided to sell tCERs instead of ICERs to the BioCarbon Fund. (See Chapter 3)

²⁷ The BioCF’s participants decided to use only tCERs as replacement credits (See Chapter 3)
the most important market for CERs.28 The persistent lack of demand is discouraging new project and making current CDM EB’s efforts to facilitate project development appear to be a waste of time.

6.29 Long-term carbon price signals are fundamental to positioning A/R CDM projects in the market. New windows of opportunities could be opened for LULUCF credits, but they remain uncertain. It was clear in COP 16 that the A/R CDM will continue to be an eligible activity under an eventual Kyoto Protocol second commitment period. Furthermore, the whole LULUCF sector could be promoted as negotiations under the Ad Hoc Working Group on Further Commitments for Annex B Parties under the Kyoto Protocol broadened the scope of LULUCF activities toward a land-based approach to emission reductions. In addition, the growing voluntary carbon market for REDD+ credits also represents an opportunity to increase the demand for A/R project developers, although the role of A/R within the REDD+ framework is still unclear.

Small Contribution to Project’s Underlying Cash Flow

6.30 The combined effect of the previously explained challenges (e.g., low ER volumes, short contracts, high transaction costs, and low credit prices) leads to a small contribution of carbon revenues to a project’s underlying cash flow. Since carbon payments are normally made upon delivery, carbon revenues may not be adequate to meet all projects’ management and/or land opportunity costs; the timing of carbon payments may also be critical for achieving expected cash flows. As explained in Chapter 3, A/R CDM projects are allowed to verify carbon credits only once every Kyoto Protocol commitment period. More flexible approaches to non-permanence, relative to temporary crediting, (e.g., a buffer approach, credit reserve, or project insurance) could allow developers to select the most convenient number of verifications for their cash flow needs. Box 6.4 illustrates the relevance of carbon revenues in the cash flow of two BioCF projects differing in their objectives and the need and size of upfront investments.

6.31 The project developers’ technical and managerial capacity also plays a role in projects’ viability. One-third of the BioCF projects were at risk because of issues related to technical and managerial capacity. In one case, for example, the lack of managerial capacity was reflected in the project entity’s decision to hold onto the underlying investment instead of taking key early actions (e.g., hiring staff, undertaking timely planting in the rainy season). In other cases, the lack of technical capacity to prepare and implement a PDD led project entities to misinterpret the land eligibility analysis29 and plant on ineligible lands, which led to severe reductions in project size.30 The feasibility

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28 There are other reasons (e.g., concerns about project developers’ ability to produce measurable, verifiable, and reportable credits) explaining the EU-ETS’s policy associated with forest temporary credits, but lack of fungibility is one of the main ones.

29 As discussed in Chapter 3, the major causes of such misinterpretation are project developers’ low capacity and the ambiguity of the land-related rules.

30 In one project alone, the area was reduced by 90 percent of its original size. (See Chapter 4.)
Box 6.4

Illustration of Cash Flow up to 2018 in Two Types of BioCF Projects

The figures below illustrate the relatively marginal impact of carbon revenues in the cash flow of two BioCF projects. In one of the projects, carbon is only a sub-product (Figure 6.5); in the other, carbon is the only source of revenues (Figure 6.6). Because of the BioCF business model, these projects receive annual carbon revenues, upon successful completion of validation.

MULTIPURPOSE PROJECT

This multipurpose project plans to reforest about 9,000 ha of severely degraded lands with native and introduced species. The main rationale for the project is to achieve profitability by producing timber, resin, and carbon credits; it also aims, however, to promote biodiversity conservation as well as to improve the livelihood of impoverished people that live in remote degraded lands. The potential for carbon sequestration is about 10 tCO₂e/ha/year over the first 20-year crediting period. The project has contracted with the BioCF for about 70 percent of its expected emission reductions from 2009-2017.

Carbon revenues helped the project developer increase its internal return rate by about five percentage points. The impact of carbon revenues in the cash flow is minor relative to revenues from other products (e.g., timber and resin). Carbon revenues are also low relative to the project’s operational costs (e.g., about seven percent) and to the landholders’ cash flows. The project entity plans to use 40 percent of the carbon credits to pay back a loan; the remaining 60 percent will be shared among the local communities and the project entity. Project

1 The relevance of the carbon revenues in projects against the cost of sequestering a tonne of carbon need to be further analyzed considering both the total ERs expected during the crediting period and all project costs.
of these projects is now at risk and is contingent on selling the carbon credits from CDM-ineligible areas in the voluntary carbon market.

6.3.3 Small-scale Projects Are Not Viable

The viability of small-scale A/R CDM projects is further challenged due to the cap on emission reductions. As explained in Box 6.3, small-scale projects have a cap in annual emission reductions imposed by the UNFCCC as a way to limit the type of projects that can benefit from simplified modalities and procedures developed to reduce transaction costs. As stated before, the transaction costs for the four BioCF small-scale projects are 30-percent lower than for large-scale projects; however, World Bank project development costs in three of them are as costly as some large-scale projects—with project development costs exceeding the average cost of $1.50 per tCO$_2$e. Therefore, with the 16,000-tonne of CO$_2$e per year limit and current credit prices, these projects struggle to achieve viability.

Figure 6.7 illustrates the stream of transaction costs and discounted carbon revenues for two BioCF small-scale projects. In the first project, a

31 One out of the three projects is still under preparation.
Note: Transaction costs include World Bank project preparation costs, validation, and verification.
governmental agency expects to bundle five small-scale projects planting introduced species on about 2,000 ha of degraded pasture lands, with a crediting period of 20 years renewable twice. The second project involves a private-company-led project with a 30-year non-renewable crediting period that planted about 800 ha of introduced and native tree species.

6.34 Taking a narrow view of these projects, the difference between the discounted carbon revenues and transaction costs of meeting the CDM requirements is slightly positive for project 1 and negative for project 2. Viability would be less if these projects were outside of the BioCF portfolio as the carbon incomes would flow only upon credit issuance. The transaction costs of meeting the CDM requirements are close to $200,000 in these projects, which is as high as the lower end of the range for transaction costs in large-scale projects. Overall viability would be less favorable for the other two small-scale BioCF projects (not shown in Figure 6.7) as carbon payments are likely to be delayed longer because the projects are planting only slow-growing native species in scattered patches of land.

6.35 In addition, the effectiveness of project bundling as a strategy to promote economies of scale is also limited. Project developers struggle with securing and managing information from multiple projects. In project 1, for example, preparing the PDDs for the envisioned five projects has been a time-consuming and costly task. In fact, five years after starting project preparation, only two of the five projects have been registered under the CDM. The project entity has struggled with providing evidence of project starting dates for some of the small-scale projects and managing the validation requirements for the others. In addition, bundled projects usually entail higher monitoring costs as DOEs have to undertake field assessments in widely scattered land areas.

6.36 With transaction costs as high as those of large-scale projects, simplified modalities and procedures have little effect on improving the viability of small-scale projects. The reduction in transaction costs achieved by these projects is minimal, their potential for carbon revenues is capped, and the rule requiring the involvement of low-income communities can further increase transaction costs where capacity is low. The modalities should be further simplified and the cap on emission reductions should be increased to facilitate small-scale projects. An increase of the price of credits is also required for the simplified modalities and procedures to have an effect on small-scale participation in the A/R CDM (Locatelli and Pedroni, 2006).

6.3.4 Frontloading Future Carbon Revenues Remains a Challenge

6.37 In the early days of the carbon market, many expected that carbon finance could serve as an instrument to raise frontloaded capital and to enhance a project’s cash flow. Carbon finance, however, was not fully understood and ERPA values were too new to be factored into bank financing. In addition, it has taken time in the overall CDM for some financial institutions to offer services that leverage ERPA values. The situation is less favorable now as lenders may no longer be willing to account for prospective CDM cash flows in debt sizing because of the current high eligibility risk of Kyoto Protocol assets. In addition, as the post-2012 market refocuses toward least developed countries, potential project developers and sponsors may be considered less creditworthy (World Bank, 2011).

6.38 Innovative financing is required to help projects secure debt with sufficient maturity to cover the high upfront cost of forest projects. In the BioCF experience, projects with good capacity have received the first carbon payments only three years after initial planting; therefore, developers had to provide resources to cover after-planting costs. Bridging this cash flow gap is critical to reducing the under-delivery risk of credits. The BioCF, taking on the entire risk of not getting credit certification, pays projects based upon CDM validation completion and according to the most accurate estimation of carbon sequestration. Still, this measure is in most cases not enough to support projects with significant delays in preparation and a lack of financial resources to cover annual tree maintenance costs. Notwithstanding, one project developer in a country with a robust forestry sector has managed

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32 Native species are planted on about six percent of the project area.
33 The analysis only considers the ERPA period and carbon revenues.
34 In p1, the difference between discounted costs and benefits is one percent of the total investment if applying a 10-percent discount rate and close to five percent if applying a 5-percent discount rate. In p2, the result is negative if applying five, eight, or 10-percent discount rates.
35 As previously stated, the BioCF pays for emission reductions achieved by projects upon validation and submission of monitoring reports.
36 See Table 6.3.
37 This may not be an option for other carbon aggregators.
to introduce innovation into their project financing by issuing forest-backed bonds in the domestic capital market (Box 6.5). Although this experience set a good precedent for forest carbon projects, it remains to be replicated more widely.

6.39 Certain instruments and insurance initiatives are starting to become available to project entities. However, these may not be enough—and certainly there is room for more innovative finance mechanisms. Innovative instruments are vital for garnering upfront investment support, and they are likely to develop as the carbon market grows. There is also room to factor in revenues from environmental services other than carbon and official development assistance. A/R CDM projects produce several environmental and socioeconomic benefits to local communities. Some markets are emerging for environmental services (other than carbon) and synergy should be promoted.

6.40 The World Bank is also developing a structured carbon bond. This instrument utilizes the World Bank’s AAA status to raise funds and is targeted at investors interested in the potential upside of carbon credits without risking their principal. The bond principal is not used to support the underlying forest carbon project; rather, it is used in regular World Bank lending operations and is essentially guaranteed to be returned to the investor. The cash flows arising from interest payments over time from the underlying World Bank lending operation which ordinarily funds the bond coupon are instead swapped for the present value. This provides a lump sum which can be invested in a project in return for a share of the carbon credits generated by the project. These carbon credits are then sold into the market and generate a variable financial return or coupon for the bond investor.

Box 6.5

Innovative Financial Mechanism in a BioCF Project in Chile

The Fundación Chile’s carbon sequestration project has afforested about 2,900 hectares in regions VII and VIII of Chile. The project has planted 1,300 hectares of Radiata pine and 1,600 hectares of Eucalyptus globulus on marginal agricultural lands, expecting to sequester over 1 million tCO2e by 2020. In addition to carbon sequestration, the project will deliver additional benefits: erosion control, land regeneration, and improvements in both biodiversity and local landholders’ well-being. Land regeneration is important in the project region as soils are extremely compacted, which prevents vegetation regeneration and water infiltration.

Financing limitations and other barriers had deterred small and medium farmers in these two regions from converting their land-use from marginal agriculture to higher-value forestry. To implement the project, Fundación Chile developed an innovative financial model that enabled these marginally productive lands to be afforested to produce social and environmental benefits. The project was financed through several sources of investment: (i) an initial contribution from Fundación Chile and the Ministry of Agriculture (10 percent of the total investment); (ii) the issuance of a “forest-backed” securitized instrument in the Chilean capital market that was supported by the net revenues from the harvest and the commercialization of forestry assets (28 percent); (iii) subsidies (27 percent); and carbon finance (35 percent).

The Fundación Chile project operates by entering into land-use contracts with small and medium landowners to use their land for a defined period of time. Land ownership remains with the original owner. In exchange for the use of their property, landowners receive $40/ha/year and 10 percent of the revenues at the time of harvest. The farmers do not assume the costs and risks associated with ongoing forest management, and Fundación Chile will replant the lands upon harvest. One of the major forestry companies in Chile, Forestal Mininco, participates in this project by guaranteeing minimum harvest volumes and planting maintenance in return for a fixed administrative fee and a variable incentive.

Acknowledgment: Cerda and Baldovino from Fundación Chile.
6.41 There are many variations on this theme but, essentially, for a 10-year bond life, about 20 percent of the bond principal value can be made available as a lump sum from the swap transaction, depending on prevailing market rates. This approach could work well for A/R projects, as the upfront investment costs are typically lower than for an energy-related project.

6.4 Recommendations

6.42 Some recommendations are presented below for the UNFCCC, CDM EB and CMP. Best practices collected based on the BioCF experience regarding project financing can be found in Chapter 8.

FOR THE UNFCCC AND THE CDM EB AND CMP

- Streamline the CDM procedures to improve the predictability of carbon revenues (see Paragraphs 6.2, 6.21 and 6.37, and Chapter 2).

- Simplify the A/R CDM requirements to reduce transaction costs. Simplified modalities and procedures should be even further simplified (see Paragraphs 6.21–6.26 and 6.28, and Chapter 5); and similarly, non-permanence should be approached through options that allow more flexibility in terms of number of verifications per commitment period to improve a project's cash flows.

- Increase the current threshold of 16,000 tCO$_2$e annually for small-scale projects and revisit the requirement that low-income communities should develop or be involved in these projects. In line with regulations for projects in other CDM sectors, participation of low-income communities in A/R CDM projects should be promoted, but not required (see Paragraphs 6.32–6.36).