

Using Climate Policies and Carbon Markets to Save Tropical Forests:
The Case of Costa Rica

By

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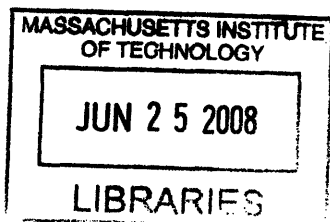
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ABSTRACT

In the late 1980s and early 1990s, advocates for forest conservation thought that climate change could provide a lever to motivate developing countries to reduce deforestation. Fifteen years after the first climate change convention, however, global emissions from deforestation have increased. This thesis uses Costa Rica as a case study to examine how international climate policies and carbon markets have addressed greenhouse gas emissions from tropical deforestation. I argue that, to date, the international climate regime has failed to provide effective incentives to Costa Rica to finance its forestry reforms because of political decisions that favor forest protection in developed over developing countries. To be effective, the international climate regime needs to generate a substantial financial investment for avoided deforestation in developing countries and develop flexible policies that build capacity, promote sustainable forestry practices, and reward early reformers.

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INTRODUCTION

Tropical forests provide myriad environmental and social benefits. Although they cover only 10 percent of the Earth's surface, tropical forests contain more than 50 percent of its species and over 25 percent of its carbon reserves (Hecht and Orlando 1998). Forests mitigate global and local environmental problems, such as desertification, air, water and soil pollution, and deteriorating coral reefs and fisheries.¹ In addition, activities like agroforestry and sustainable harvesting benefit rural communities by generating income and sustainable livelihoods (Swingland 2003).

Despite the well-established environmental and social benefits of conserving forests, tropical deforestation continues at an alarming rate, and international efforts to protect forests in developing countries have largely been unsuccessful. Many developing country governments have resisted international norms and policies that would prevent timber companies and agro-industries from exploiting forests. Moreover, the international community has not committed to compensating countries for forest conservation. Consequently, to many developing countries the value of cutting down trees, however marginal, appears to be greater than that of protecting forests. The low premium put on conserving natural forests by international agreements not only fails to reduce deforestation, but also makes it difficult for those who want to preserve their

¹ Tropical forests moderate streamflow and absorb nutrients such as phosphorous and nitrogen. In coastal areas, this moderation and absorption can help prevent eutrophication.

forests to finance forest reforms.

In the late 1980s and early 1990s, it became apparent that climate change could provide a lever for advocates of forest conservation to motivate developing countries to reduce deforestation. Scientists pointed out that land-use changes, principally tropical deforestation in developing countries, account for 20 percent of the human-induced greenhouse gas emissions annually –releasing more carbon dioxide than all the cars and trucks in the world (Gelling 2008). Most economists also agreed that the cheapest and most efficient way of reducing global greenhouse gas emissions would be to provide incentives to developing countries to curb their rates of deforestation and increase forest cover (Newell and Stavins 2000). In 1992, in response to this consensus, international negotiators began creating a mechanism to address deforestation. This mechanism, later known as the Climate Development Mechanism, was touted as win-win opportunity: to reduce the costs of compliance developed countries had an incentive to invest large amounts of capital in developing countries, while developing countries finally would receive the financing needed to conserve their forests.

Yet since the first UN Framework Convention on Climate Change in 1992, global emissions from deforestation have increased. In fact, primarily as a result of deforestation, Indonesia has become the third biggest global emitter in the world, following the U.S. and China (Gelling 2007). Although domestic political

choices explain part of the increasing trend in deforestation, it is clear that the international climate change regime has failed to address the continuing deforestation in developing countries.

This thesis uses Costa Rica as a case study to examine how international climate policies and carbon markets have attempted to stem greenhouse gas emissions from tropical deforestation. It asks: 1) How successful has Costa Rica been in using international climate policies and carbon markets to support its sustainable forestry reforms? 2) What factors have made it more or less successful? Costa Rica provides a strong case to examine the effectiveness of international efforts to reduce greenhouse gas emissions from deforestation because the Costa Rican government has the political will to reduce deforestation and the capacity to participate in a sophisticated global climate regime; at the same time, Costa Rica faces the same challenge as other developing countries in financing domestic forestry reform. According to scholars who study environmental aid, capacity and concern are two of the “three Cs” that typically limit the effectiveness of international environmental aid to developing countries. The third, contracting, depends on the mechanism for distributing funds. Costa Rica thus represents what is known in political science as a “most likely case”: if Costa Rica is unsuccessful at using international policies to finance its forestry reforms, it is difficult to imagine how another developing country could manage; there is almost certainly a flaw in the international mechanism for

disbursing funds.

I argue that, to date, Costa Rica has been unable to use international climate policies and carbon markets to finance the forestry reforms that it hoped to undertake because of political decisions that favor the interests of developed countries over those of forestry advocates in developing countries. Although nearly all countries have agreed on the need to address climate change, domestic priorities have determined which policies were included and excluded as remedies. In the negotiations over incentives for land-use and forestry projects, countries with greater political bargaining power and stronger alliances have consistently prevailed. The resulting rules included deforestation incentives for developed countries but not for developing countries. Furthermore, efforts to reduce uncertainty and quantify carbon sequestration as accurately as possible have yielded rules that are much more complex and cumbersome for developing countries than for developed countries. Not only have international climate policies failed to promote widespread reforestation, but they also have created a perverse incentive to develop projects that maximize carbon sequestration at the expense of other social and environmental benefits. In fact, the Climate Development Mechanism actually *penalizes* Costa Rica for its earlier reforms because it focuses solely on incremental carbon uptake at a project level instead of widespread national changes in reforestation and deforestation. Voluntary international carbon markets offer early reformers like Costa Rica some financing

opportunities, but without mandatory caps such markets are unlikely to serve as an adequate source of financing because of the low price of offsets.

Though Costa Rica initially hoped to finance its own sustainable forestry reform through international climate policies and carbon markets, it has shifted its strategy from a market-based approach focused on the international arena to one that relies primarily on domestic regulation. As the international climate regime refocuses its efforts to reduce emissions from deforestation in the next commitment period, the Costa Rican case suggests the need for more flexible policies that encourage developing countries to reduce their deforestation levels, promote healthy biologically diverse and socially beneficial forests, and reward early reformers for their contribution to addressing deforestation. Nonetheless, to be effective, developed countries need to take on deeper emissions cuts to generate the capital necessary to save tropical forests.

I ground this argument about Costa Rica's experience in the literature on the following topics: climate change and developing countries, land use and forestry issues, the debate over CDM as a way to promote sustainable development, international carbon trading, the role of science in policymaking and international environmental treaties and aid.

My analysis of the Costa Rican case is based on primary and secondary source materials. I conducted semi-structured interviews with individuals familiar with Costa Rica's conservation and climate policies, as well as experts on the

CDM and international carbon trading. The list of interviewees is in Appendix A, and particular projects are described in Appendices B, C, and D.

ASPIRATIONS FOR ACTIVITIES IMPLEMENTED JOINTLY

Although it once had the highest deforestation rate in the western hemisphere, through a series of reforms from 1980s to the early 1990s, Costa Rica succeeded in reducing its deforestation rate from 59,000 hectares to 4,000 hectares per year. Nonetheless, domestic political opposition, international pressure to reduce public spending, and new scientific findings jeopardized the country's conservation policies. In 1992, however, international climate policy created an opportunity to finance a long-term sustainable forestry policy, and Costa Rica tried to capitalize off it: domestically, the government created policies, institutions, and projects to take advantage of the funds from the newly created Activities Implemented Jointly program; internationally, Costa Rican negotiators fought against other developing countries for a permanent climate financing mechanism. Despite these efforts, Costa Rica struggled to finance most of its forestry projects during the AIJ period, because it overestimated the demand and price for the unregulated offsets market. Although it met few of its objectives, during the 1990s, Costa Rica positioned itself as a leader in carbon forestry projects and its innovations helped shape the new regulatory market.

Past Forest Policy: A Struggle for Consensus

Although in 1980 Costa Rica had the highest deforestation rate in the Western hemisphere, through a series of policy reforms between the 1960s and 1980s, Costa Rica succeed in reducing deforestation and now boasts that 23 percent of the country's 5.2 million hectare landmass is designated as protected areas (InBio 2000). Yet Costa Rica has struggled to maintain its forest conservation initiatives because of domestic political opposition and international pressure to reduce public spending.

In 1950 an estimated 60 to 90 percent of the Costa Rica's 52,000 square kilometer surface area was forest cover. By 1987, however, only 17 percent of the nation's forest cover remained (Sánchez-Azofeifa et al. 2003). Farmers cleared land for coffee and bananas or cattle grazing, and developers razed trees to accommodate a growing population. As a result, by 1980 Costa Rica was losing four percent of its forest cover, approximately 59,000 hectares, annually (Sánchez-Azofeifa et al 2003; de Camino et al 2000).

From the late 1970s to the early 1990s Costa Rican policymakers tried to stem the rate of forest loss. Most notably, in 1986 President Oscar Arias passed one of the country's most environmentally protective forestry laws. It created the ministry of environment (originally called MINEREM and changed in 1992 to MINAE) and transferred the authority over forests and national parks from the ministry of agriculture and livestock to the new ministry.² The 1986 Forestry Law also reversed an existing law that gave settlers land rights if they cleared public

² MINEREM stands for Ministerio de Recursos Naturales, Energía, y Minas and MINAE for Ministerio de Ambiente y Energía.

lands, consolidated national parks into a protected area system, and required landowners to acquire approval before cutting down trees on forested lands. In addition, from 1986 to 1994 Costa Rica developed a series of loan and grant programs to encourage commercial reforestation and environmentally-sound forest management on private lands. Together these reforms helped curb deforestation to 4,000 hectares per year (FONAFIFO 2005).

Many of these reforms were politically and economically unstable, however. In 1990 the Supreme Court contested the legality of the 1986 law, which had passed through Executive Decree instead of by a two-thirds majority in the Legislative Assembly. Discontented landowners and the commercial logging industry had challenged the law, claiming it violated their private property rights (Fairman 1998). In a subsequent case the court ruled that the government was required to compensate private estates within the expanded national park boundaries for the indemnification of their lands (Vohringer 2004; Dutschke 2000). The court asserted that until landowners had been compensated, these areas were not officially protected. From 1990 to 1994, conflict among commercial loggers, private landowners, agricultural interests and conservationists thwarted efforts to pass a new forest law under the Calderon administration (Fairman 1998).

Concerned about the longevity of existing conservation efforts, conservationists began to pressure the government to enhance coverage and public ownership of its national parks by purchasing private lands. While the landowner-incentive programs were politically popular, many conservation

groups considered them temporary and insufficient to protect biodiversity in the long term (Janzen 2008). Additional policies were needed to consolidate the national parks in perpetuity. In 1994 a group of conservationists released the GRUAS report calling for Costa Rica to increase its forest cover under protection by an additional ten percent.³ The report identified areas of biological importance that existing protected areas did not cover, as well as areas without biological importance that were currently protected. The writers argued that that new land needed to be incorporated into the national park system, while other parcels could be discarded. Such a reconfiguration, they said, would protect 90 percent of the country's biodiversity (which accounts for four percent of the world's biodiversity) (Salazar et al. 2000; Janzen 2008).

In addition to political challenges, the landowner incentive programs faced an uncertain economic future. From 1979 to 1996 Costa Rican subsidies to forestry totaled \$100 million (de Camino et al. 2000). International institutions, such as the International Monetary Fund and World Bank, put pressure on Costa Rica to reduce public subsidies. For example, in order to comply with the terms of its third Structural Adjustment Loan, the World Bank wanted Costa Rica to cancel many subsidies to the forestry sector (de Camino et al. 2000).

International financing for conservation was also unreliable. The Global Environmental Facility (GEF), which is in charge of disbursing funds for international environmental conventions, is chronically under funded and burdened by other conflicts (Fairman 1996). More generally, international

³ The name GRUAS was a play on words. GRUAS is the Spanish name for industrial tow truck company. According to Daniel Janzen, director of the Guanacaste Conservation Area, Costa Rica's environmental reforms were stuck in the mud. Only an industrial strength government effort could get it out.

financing to Costa Rica has declined at a higher rate than to other countries (Murillo 2008).

The Climate Convention and Developing Countries

Even as Costa Rica struggled with the political and economic fallout from its domestic forestry reforms, an opportunity arose in the international arena. The 1992 UN Framework Convention on Climate Change (UNFCCC) was the first international response to global climate change.⁴ At the time, there was considerable scientific uncertainty about the precise impacts of climate change and how best to address it, but the parties agreed in 1992 that given the potential dangers of climate change, scientific uncertainty did not justify inaction. The goal of the UNFCCC negotiations was to develop a strategy to stabilize the greenhouse gas concentration in the atmosphere at a level that would prevent dangerous interference with the climate system. Although developing countries resisted emissions commitments of their own, all parties agreed to allow for a period of experimentation in which countries could implement offset projects jointly.

In the negotiations over the UNFCCC, most developing countries demanded to be exempt from any emissions reduction. Their arguments were both ethical and practical. They argued that as the main emitters of greenhouse gases, developed countries should take the lead in addressing the problem.

⁴ Since the 19th century, atmospheric CO₂ concentrations have increased by about 25 percent, mainly due to the combustion of fossil fuels and land use changes. Over the last century, this accumulation has resulted in an increase in global surface temperatures of about 0.6 degrees centigrade, which is projected to increase between 1.4 to 5.8 degrees over the course of the 21st century. Although scientists have been tracing these increases since the 1970s, in 1990, the International Panel on Climate Change (IPCC) released its first report confirming that global warming was a threat and calling on nations to develop a treaty to address the problem (UNFCCC 2002). This report influenced nations to form the UNFCCC.

Moreover, industrialized countries had the money to pay for emissions reduction. In contrast, they said, developing countries were resource poor and had more pressing concerns, such as economic development to meet their basic material needs (Moomaw et al. 1999; Richards 2001).

In order to differentiate the responsibilities of developed and developing countries, the UNFCCC divided parties into two groups: Annex I countries that include industrialized countries, and non-Annex I parties mainly made up of developing countries. To demonstrate their leadership, Annex I parties were expected to adopt climate change policies, reduce emission to 1990 levels, and help developing countries reduce their emissions through financial resources and technology transfer (Article 4).

Despite these commitments, the framework convention did not set any legally binding targets for emissions reductions on either party. In April 1995, at the first Conference of Parties (COP1), in a decision known as the Berlin Mandate, the parties agreed to launch a new round of talks to decide on stronger commitments for Annex I countries. Those discussions culminated in the 1997 Kyoto Protocol, in which Annex I countries agreed to reduce their emissions by at least five percent below their 1990 levels.

In addition to agreeing to another round of negotiations, at the COP1, all parties agreed to allow a pilot phase of Activities Implemented Jointly (AIJ). Under AIJ, developers from Annex I countries could implement projects that reduced or sequestered greenhouse gas emissions in developing countries or jointly with other developed countries. Since the cost of developing a carbon

offset project is lower in developing countries than it is in industrialized countries, and the environmental effect is the same, some Annex I parties argued that joint implementation was the key to a cost-effective climate change policy (UNFCCC 2002). A 1998 World Bank study showed that it would cost Annex I countries \$120 billion to reduce emissions by five percent below 1990 levels through domestic initiatives alone--a cost that dropped to \$11 billion if joint implementation with developing countries was allowed (Chomitz 2000).⁵

Although AIJ did not count toward future emissions targets, countries like Norway and the United States, who were concerned about the cost-effectiveness of greenhouse gas mitigation, were enthusiastic about the potential of the program and invested heavily in the AIJ pilot. They viewed joint implementation as a win-win situation: it provided technology and financial transfers to developing countries while giving wealthy countries flexibility to meet their emissions reductions commitments in a cost-effective way. But many developing countries saw it differently. For them, this flexibility allowed wealthy countries to shirk their responsibility for global warming and impose more conditions on much-needed development assistance. Making matters worse, AIJ would allow foreign developers to implement projects in developing countries that were not in those nations' best interests (Werksman and Cameron 2000). Nonetheless, they agreed to a period of experimentation, leaving the negotiations about a permanent mechanism for a later date.

Forestry and other land use offset projects were encouraged during AIJ.

⁵ Another study indicates that these costs for Annex I implementation would be \$250 billion dollars if they did it alone; \$80 billion if investments in developing countries was allowed (Castro et al 2000).

Although scientists were uncertain about how much carbon forests actually store and their methods to quantify this sequestration were relatively crude, AIJ provided an opportunity to learn by doing—to develop baselines and improve methods of quantification and verification, which could be used later for offset projects that counted towards Annex I party obligations. At the time, scientific studies estimated that deforestation in tropical areas had contributed between 20 to 40 percent of the global emissions of carbon dioxide during the 1980s (Houghton 1990; Backstrand and Lovbrand 2006). Annex I countries that supported AIJ also were also particularly enthusiastic about forest projects because they believed that the cost for developing and implementing these projects were low compared to energy projects (Newell and Stavins 2000).

Unlike many of their developing country counterparts, Costa Rican policymakers were optimistic about the potential of AIJ and future international climate policies to finance the forestry reforms that it wanted to undertake. A 1993 World Bank study on the economic value of Costa Rican forests had estimated that 66 percent of the benefits generated from national forests went to the global community (de Camino et al. 2000). Based on this calculation, Costa Rican policymakers hoped to generate the bulk of their forestry financing from the climate market. Of the 145 projects listed under AIJ, ten were in Costa Rica, five in energy and five in forestry (see Appendix B) (UNFCCC; UNFCCC 2008; Werksman and Cameron 2000).⁶ Costa Rican officials hoped to use international climate policies to reverse the country's deforestation, conserve its

⁶ Castro 2000 claims that there were 15 projects proposed, but the UNFCCC official website only has a record of 10. According to Tattenbach, Costa Rican policymakers including himself may have been exaggerating the number of projects (Tattenbach 2008). In addition, the UNFCCC claims that there were 145 projects but only 77 are listed.

biodiversity, and stimulate rural development.

Reframing the Value of Forests to Include Sequestration

In 1994, the year that the UN Framework Convention on Climate Change came into effect, Costa Ricans elected a new president, Jose Maria Figueres. Building on the momentum of the Rio Convention, Figueres announced his plan to promote “sustainable development in alliance with nature” in all government policies (Fairman 1998). While Figueres hoped to pass a new forest law, he faced many of the same problems as his predecessors. He needed to unite different constituencies who had resisted the previous administration’s attempts to reform the country’s forestry law. He simultaneously faced pressure from conservationist groups to consolidate protected lands. And he had to find new sources of financing for its initiatives. The potential for international climate financing created an opportunity to address these different challenges. In the next four years of the Figueres administration, Costa Rican conservationists created policies, institutions, and projects to take advantage of the international carbon funds and permanently establish its forest reforms.

To prepare for AIJ, in 1994, President Figueres established the Costa Rican Office of Joint Implementation (OCIC) to act as the coordinating body for joint implementation projects.⁷ The role of OCIC was to promote carbon sales on the international market and represent Costa Rica in future climate negotiations (UNFCCC n.d.; Salazar et al. 2000). OCIC signed contracts that would allow Costa Rica to implement projects jointly with the U.S., Norway, Holland,

⁷ OCIC stands for la Oficina Costarricense de Implementacion Conjunta

Switzerland and Finland (Castro et al. 2000).

In the first two years of AIJ, Costa Rican conservationists experimented with a variety of carbon forestry projects that would become the basis for its comprehensive policy reforms. In 1994 the newly appointed head of OCIC, Franz Tattenbach, proposed Carfix—a 108,265 hectare conservation and restoration project—to the U.S. AIJ board. Carfix promised to generate \$32 million over twenty years for public land restoration and landowner incentives (Janzen 2008; UNFCCC 1994). Tattenbach, who was also the director of a conservation non-profit FUNDECOR, in the Central Volcanic Mountain Range Region near the country's capital, proposed Carfix as a pragmatic way to conserve lands that could buffer of the World Biosphere Reserve of Braulio Carrillo National Park. Approximately two-thirds of the lands were within a protected area but were highly degraded, and a third were marginal pasturelands or degraded forests on private lands. Funds were needed to ensure that “farmers and landowners have a sufficient annual income to provide competitive alternatives to land uses that lead to deforestation” (UNFCCC 1994). Carfix proposed employing a mix of commercial forestry and natural regeneration (UNFCCC 1994; Dutschke 2000).

Adapting the Carfix model, one of the writers of the GRUAS report, Daniel Janzen, developed a 58,000-hectare project called Biodiverfix on the Pacific Coast for the Guanacaste Conservation Area. Rather than providing incentives to landowners, Janzen proposed using the carbon offsets generated through restoration and conservation to buy up private lands within the national park

boundary and fund park restoration and maintenance for 20 years (UNFCCC 1994; Janzen 2008). Janzen envisioned using the international carbon market to finance the reforms advocated in the GRUAS report. A similar 2500-hectare project, called Ecoland, was also established in the southwestern Osa Peninsula (UNFCCC 1994).

These three projects proposals, all initiated by conservationists, highlighted the possibility of using international climate finance to mitigate the domestic conflict over the earlier reforms. They could be used both to finance landowner incentives favored by the commercial timber industry and small landowners and the national park consolidation advocated by conservationists. In fact, these three projects helped shape Costa Rica's new comprehensive environmental policy and the government's approach to carbon financing.⁸

In 1996 Costa Rica developed a new forestry law that enabled it to receive and distribute future carbon funds to both private landowners and the national park system—thereby mitigating both of the main tensions that had arisen over its earlier forestry reforms. The objectives of the 1996 Forestry Law were:

To stimulate conservation, protection, and administration of natural forests for biodiversity, to promote the production and development of forest resources in a sustainable way, and to generate employment and an increase in the standard of living in the rural population (La Gaceta 1996).

⁸ Paul F Steinberg notes the importance of these “bilateral activists” who operate simultaneously in the domestic and international arena in shaping domestic environmental policies in developing countries. These individuals who typically function outside the bureaucracy have close ties to domestic parties and bureaucrats and work also with international organizations and financing institutions. Janzen has roots with the Nature Conservancy and Tattenbach has close ties to a number of donor agencies and through his work with OCIC to the UNFCCC. They both are strongly affiliated with the National Liberation Party (PLC) (Steinberg 2001).

In order to realize these objectives, the law established two main programs: one focused on private landowners and another on national park consolidation. Generating revenue through the international carbon market was the focal strategy for financing these two programs. According to Costa Rica's environmental minister at the time, Rene Castro, Costa Rica would be a testing ground for the "hypothesis that markets could be used to drive sustainable development" (Castro et al. 2000).

In collaboration with the OCIC, Castro refashioned the country's existing small grant programs into a single, market-based program to finance forest conservation on private lands. The new program, known as the *Pagos de Servicios Ambientales* or PSA, authorized the government to finance "environmental service payments" to landowners by selling services, including carbon sequestration, on the national and international markets. As with the original grant program, the government paid landowners enrolled in the program for activities such as conservation, sustainable management and commercial reforestation. Instead of offering grants or loans to support these activities, however, the government paid landowners for the environmental benefits that their activities generated. In effect, the new PSA program transformed what had been a subsidy for forestry activities into a payment for an environmental service, such as carbon sequestration, which now had a market value thanks to the international climate change policies. Commenting on this new approach to

forestry finance, Castro argued that “the sale and exploitation of our forests is one of the best tools for preserving them” (FONAFIFO 2005).

Although carbon sequestration was a fundamental element of the new ecosystem service payment program, other benefits such as biodiversity, water quality, and scenic beauty were also built into the PSA program. These other benefits could also be sold to international pharmaceutical firms, local water and hydroelectric producers, and hotels and ecotourism groups.⁹ Nonetheless, Costa Rican officials believed that international carbon market would be “the most important potential financing instrument for environmental services” (de Camino et al. 2000). To help jump-start the program, the Legislative Assembly also established a 15 percent gas tax, one third of which was designated for environmental services payments (Dutschke 2000; Salazar et al. 2000; UNFCCC n.d.).

To broker and administer these payments, the forestry law created a new entity, the National Forestry Financing Fund or FONAFIFO.¹⁰ FONAFIFO's main goal was to restore Costa Rica's forest cover as close to its original 70 percent coverage as possible (FONAFIFO 2005). While this level appears high, studies indicated that 60 percent of Costa Rica's land was best suited for forest. Of the 35 percent of land then in pasture, only eight percent was actually suitable for

⁹ The first environmental service payment in Costa Rica is believed to have occurred in 1991, when the non-profit group FUNDECOR paid farmers to exploit the scenic beauty of their landscape by building hiking trails through the property (FONAFIFO 2005).

¹⁰ Fondo Nacional de Financiamiento Forestal or FONAFIFO was not a completely new entity. Existing grant programs were financed through variety of forest Trust funds (340 in total) and managed by different entities. The creation of FONAFIFO marked the consolidation of these funds into one package to be administered by one entity (FONAFIFO 2005).

that use (Castro et al 2000). Increasing forest cover was the main objective of the PSA program, but FONAFIFO was also supposed to meet social objectives. In addition to the benefits of biodiversity conservation, watershed protection, and carbon capture, FONAFIFO was to orient its program towards small and medium-sized landowners to help them generate income (La Gaceta 1996).

In addition to the private forestry program, the environmental ministry intended to sell carbon credits for the country's protected areas and buy up the rights to lands identified in the GRUAS report (Castro et al. 2000; Pagiola 2006; FONAFIFO 2005). The new law authorized government officials to expropriate lands in exchange for just payment and prohibited tree cutting within national forest boundaries and land-use changes without government permission (La Gaceta 1996).

According to Costa Rican policymakers, the law represented a "new paradigm for forest conservation" (FONAFIFO 2005). It was the first law to correct for the "market failure to internalize the benefits of conservation...borne by landowners, whether they are public entities such as the park service or private ones, such as small farmers" (Castro et al 2000). The market-based approach also allowed the policy to "transcend presidential terms" by making conservation finance independent of politics (FONAFIFO 2005). Moreover, by addressing the social, environmental and economics benefits of forests together and combining both landowner payments with permanent parks consolidation,

the law represented a win-win situation for all stakeholders.

In addition to creating an ambitious set of forestry reforms, the Costa Rican government found a way to address some of the major criticisms of joint implementation. As noted earlier, many developing countries opposed joint implementation because they feared foreign developers would create projects that were not in the host country's national interests. The environmental service program empowered FONAFIFO to develop local projects and transfer the "certified tradable offsets" (CTOs) to the Ministry of Environment (MINAE), who would sell them in bulk to developers. This mechanism had a three-fold purpose. First, foreign investors now had a streamlined way to achieve emissions reductions without the burden of developing the project in the foreign country themselves. Second, the Costa Rican government could develop projects based on its own sustainable development priorities, rather than those of foreign developers. Third, the government could develop small projects on private lands, package them together and sell the offsets in bulk (Castro et al. 2000; Salazar et al. 2000). The latter provision addressed some foreign concerns about the cost-effectiveness of small projects, which can have high transaction costs of contracts, and domestic equity concerns about who would benefit from the program. To reduce the risk of carbon forestry projects, the government developed a reserve of carbon offsets (30 percent of all sales) in case a landowner dropped out of the program, or a reforestation projects was

compromised (Castro et al. 2000).

Through the use of certified tradable offsets, Costa Rica became the first developing country to design and implement an AIJ project on its own. In July 1996 the Norwegian government agreed to spend \$2 million on 200,000 certified tradable offsets for a 4000-hectare conservation project in the Virilla watershed. The project embodied Costa Rica's aspirations for the carbon market. Located near San Jose, the nation's capital, the Virilla watershed was highly contaminated because of its proximity to industry in the nearby free trade zone. In order to protect the watershed, Costa Rica used some of the Norwegian funds to purchase 1000 hectares of primary forest for protection. FONAFIFO used the remainder to pay landowners to abandon grazing, restore natural forests and develop a small-scale commercial tree plantation (Subak 2000; Dutschke 2000).

The Virilla watershed purchase jump-started the private-incentive program and raised Costa Rican expectations for the carbon market. Instead of submitting individual forest projects in localized areas to the AIJ boards of individual countries and waiting for buyers, as it had done with Virilla, Costa Rica repackaged its two main programs—the consolidation of national parks and private land forestry program—into two umbrella projects and placed them on the Chicago Board of Trade stock exchange (Dutschke 2000; Roeder 1997). From the perspective of the administration, placing the umbrella projects on the stock exchange instead of looking for buyers for individual projects, would allow the

government to finance its forestry programs consistently, by making a constant supply available for buyers (Castro et al 2000).

The *Chicago Sun-Times* reported that Costa Rica's carbon offsets would be "the first tradable commodity of global benefit," and would generate tens of billions of dollars to protect Costa Rican rainforests (Roeder 1997). The 530,000-hectare Protected Areas Project (PAP), which now included much of the lands targeted for national park consolidation, including Biodiversifix, was expected to generate between \$150 to \$300 million for the sequestration of 15 million tons of CO₂ over 20 years. If used to finance the changes recommended in the GRUAS report, this would be enough to protect 90 percent of Costa Rica's biodiversity (UNFCCC 2008; Janzen 2008; Dutschke 2000; UNFCCC n.d.). OCIC also planned on enrolling hectares on a rolling basis for lands under the incentive program, which were listed under the Private Forestry Project (PFP). In order to broker these sales, OCIC established an exclusive contract with the Center for Financial Products to sell four billion tons of CTOs on the exchange over 20 years, at a minimum price of \$10 per ton of CO₂ sequestered (Castro et al. 2000).

Ultimately, five projects were listed for AIJ financing in Costa Rica. In addition to the two listed on the Chicago Stock Exchange, the original Ecoland and Carfix projects remained on the U.S. AIJ list. A large commercial developer also submitted a 6,000-hectare commercial reforestation project known as Klinki

(Dutschke 2000; UNFCCC 1997). According to Tattenbach, this project was not in line with Costa Rica's main goals for the carbon market—fusing forest conservation and biodiversity protection with rural development (Vohringer 2004; Dutschke 2000). Nevertheless, OCIC accepted the project to increase private sector involvement in the carbon market. In total, these projects added up to approximately 650,765 hectares of land and more than 105 million metric tons of CO₂ offsets (UNFCCC n.d.). Based on the floor price established by OCIC, Costa Rica expected to generate more than a one billion dollars through joint implementation.

The Battle for a Permanent Mechanism

While Costa Rica was positioning itself domestically to take advantage of AIJ, it was also fighting a heated battle on the international front to secure the permanency of carbon funding. Despite the launch of AIJ, developing countries continued to fight against the inclusion of any flexibility mechanisms, including joint implementation. Costa Rica was the first to break from the G-77 in support of a permanent mechanism for joint implementation and maneuvered to build support for this initiative.

Most environmental NGOs and developing countries believed that industrialized countries needed to focus on emissions reductions within their national boundaries. In 1995, at the COP1, Brazil put forth a proposal for the

creation of a punitive fund, into which Annex I countries would be forced to pay if they failed to meet their emission reduction commitments. This money would be invested in a Clean Development Fund, which developing countries could use for sustainable development and adaptation projects. Although the first draft proposal of the Kyoto Protocol excluded the Clean Development Fund, the G-77 rallied behind the idea of financial penalties and the text was reinserted in a subsequent draft (Olsen 2005).

According to Cristiana Figueres, one of Costa Rica's climate change negotiators, Costa Rica did not believe that developed countries would agree to penalties and approached U.S. negotiators to develop a compromise. In discussions with the U.S. negotiators, Figueres and others suggested transforming the Brazilian concept of the Clean Development Fund into a positive proposal that both developing and industrialized countries could agree on (Figueres 2008). The final package, which became known as the Clean Development Mechanism in the Kyoto Protocol, transformed the Brazilian idea of a fund that penalizes Annex I countries for not complying into a mechanisms that helps them comply.¹¹

Agreement on the CDM was a breakthrough in the conflict between developing and industrialized countries over global climate change. Known as the "win-win mechanism" or the "bridge between North and South," the CDM

¹¹ Annex I countries who do not meet their commitments in the first compliance period are penalized from using the CDM in future compliance periods, however.

allowed industrialized countries to reduce emissions in a cost-effective way and helped poorer countries develop sustainably (Olsen 2005). In the eyes of the Figueres administration, the agreement canonized the possibility of using carbon financing for its own sustainable forestry reform.

Costa Rica Struggles to Get Financing for AIJ

Despite Costa Rica's domestic and international efforts, only two of the five listed forestry projects, Ecoland and Norway, were actually financed through AIJ (UNFCCC 2008). Only 2,500 hectares of parklands were purchased, compared to the 530,000 hectares proposed (UNFCCC 2008). In addition, although Costa Rica enrolled 200,000 hectares in the PSA program, only 4,000 were financed through carbon sales (Pagiola 2002; UNFCCC 2008). Costa Rica had hoped to generate one billion dollars and preserve 650,765 hectares through carbon sales, but by the end of the AIJ period, it had generated only \$2.95 million for 6,500 hectares (UNFCCC 2008). This figure is quite low given that 76 land-use and forestry projects were transacted as part of AIJ, equivalent to 40 million tons of CO₂. Twenty-one percent of all AIJ transactions during the period between 1996 and 2003 were forestry projects (Pearson et al. 2006).

Given Costa Rica's efforts to position itself as a leader in the AIJ process, its inability to attract buyers is difficult to understand. First, Costa Rica may have been overestimating the price of its CTOs and the size of the AIJ market.

Although the initial sale of Ecoland credits went for a mere \$4.40 per metric ton of CO₂, the Norwegian investment equaled 2 million dollars (\$10 per ton of CO₂) (Dutschke 2000). To reinforce the integrity of its credits and gain investment support, OCIC hired an independent verifying organization, SGS Switzerland, to reassess its initial estimations for the Private Area Project and Private Forestry Project. After verification, OCIC raised the price to \$20 per ton of CO₂ (Dutschke 2000). This high price may have deterred other investors. Most forestry projects during this time were going for between 50 cents and \$5 per ton of CO₂ (Miranda et al. 2004). The Norwegian deal, as well as the subsequent assessment, may have warped funding expectations for the program: the initial projection of generating \$150 to \$300 million for the consolidation of national parks was based on this price.

In any case, the market may not have been ready for the kind of large projects that Costa Rica had assembled. Janzen had been in discussion with a number of possible investors for Biodiversifix, but when it was incorporated into the large Protected Areas Project, investors were concerned about where their investments would be placed (Janzen 2008; Roeder 1997). Investors were suspicious of the large size of these projects and their high estimated benefits. Moreover, Costa Rica was the only country using financial markets to attract investors. They based their model on the successful U.S. market for sulfur oxide pollution, but trading carbon offsets was new to the U.S. market—and

furthermore was not required by regulation (Castro et al 2000). According to Mark Wishnie, Director of Project Management for Equator Environmental, an environmental brokerage firm, “Costa Rica was way out in front of everyone else. They took action before markets were in place” (Wishnie 2008). The U.S.’s decision to drop out of the Kyoto Protocol in 2001 also may have hurt Costa Rica’s efforts to attract investors. Without even the threat of regulation, few companies had an incentive to invest in carbon-offset projects.

In short, although it met few of its objectives, during the 1990s Costa Rica positioned itself as a leader in carbon forestry projects and its innovations helped shaped the new regulatory market. Not only did Costa Rican negotiators help shape the CDM, the “certified tradable offsets” (CTOs) developed by environmental officials became the building blocks for the emissions trading system for the CDM. Instead of depending on private developers from Annex I countries to design and implement projects within their borders, developing countries could now create their own projects and sell the certified emissions reductions (CERs)—a modified version of Costa Rican CTOs—to companies with emission reduction commitments. In addition, Costa Rica’s initiative to sell CTOs on the stock exchange presaged the creation of a full-fledged carbon emissions trading scheme. Ironically, Costa Rica had trouble taking advantage of this new market that it had helped create.

FORESTRY AND THE CDM

Although Costa Rica reshaped its forestry policy to take advantage of international carbon financing, decisions on the international level undermined these efforts. Specifically, political bargaining by international negotiators—in which developed countries justified their self-interested positions using science-based arguments—resulted in the exclusion of avoided deforestation from the CDM. The result: developed countries were allowed to get emissions credits for land-use and forestry projects, whereas developing countries could only sell credits for reforestation. This decision thwarted Costa Rica's aspiration to use international carbon credits to consolidate its national park system and finance conservation payments, forcing it to look for new sources of funding. Not only did the rules of the CDM inadvertently penalize Costa Rica for its early attempts to reduce deforestation, but the unitary focus on calculating net emissions reductions and reducing scientific uncertainty, coupled with the high cost of implementation, made it difficult for developing countries in general to implement socially and ecologically responsible projects. Despite the weakness of the CDM, FONAFIFO's newfound financial independence strengthened its ability to develop projects that link carbon sequestration with other sustainable development benefits. Yet this financial independence came at a price – the abandonment of Costa Rica's efforts to consolidate the national park system.

Negotiating the Inclusion of Forests in the CDM

After reaching an agreement on the CDM in 1996, negotiators began to debate whether or not to include natural sinks in the Kyoto Protocol. Natural sinks consist of a variety of different activities such as forest conservation, reforestation, and sustainable management of forests, crops, or grazing lands. In the climate conventions, these are grouped together in a category known as Land Use, Land Use Change, and Forestry or LULUCF. Annex I and non-Annex I parties were divided about the inclusion of sinks. Forest conservation—known as avoided deforestation or reducing emissions from deforestation and degradation (REDD)—was particularly controversial. Although scientific uncertainty in calculating carbon uptake from carbon forest projects was used to justify the final decision, the negotiations ultimately came down to competing national interests, alliance building, and the power dynamics between the parties. This decision put a damper on Costa Rica's aspirations for using climate financing to support its forestry reforms.

Scientists agree that forests, and other types of vegetation, serve as natural sinks for greenhouse gases that account for more than 75 percent of the carbon stored in the earth's ecosystem and 40 percent of the carbon exchanged between the atmosphere and earth annually (Hamilton et al. 2002).¹² According

¹² When plants undergo photosynthesis, they convert CO₂ from the atmosphere and sunlight into energy and oxygen. As a tree grows, most of the carbon that plants take in becomes part of the tree's biomass, its roots, trunk, branches and leaves. A newly planted tree takes in a lot of carbon as it grows. Some of that carbon however goes back into the atmosphere, when trees exhale CO₂ at night. Moreover, when a tree dies or is cut down, the remaining biomass on the forest floor decays and also releases CO₂ into the atmosphere. While some carbon is stored in soils, a dying or cut down tree is a net-emitter of CO₂, compared to a live one that is a net CO₂ sink. For this reason, most scientists agree that

to the International Panel on Climate Change (IPCC), from 1895 to 1998, 50 percent of anthropogenic greenhouse gas emissions resulted from land-use changes, mainly from deforestation (IPCC 2000). While this contribution has decreased over the century, between 20 and 25 percent of anthropogenic CO₂ emissions during the 1990s resulted from land-use changes, primarily tropical deforestation—the second largest cause after fossil fuel combustion (IISD 2007).

Although the link between deforestation and climate is well established, at the time of the negotiations scientists were uncertain about what the long-term impact of climate change would be on the ability of forests to take up and store carbon; scientists were also concerned about their ability to measure that uptake. Early experiments indicated that elevated CO₂ levels could actually make trees grow faster (Clark 2004). More recent studies, however, have shown mixed results (Clark 2004; Feeley et al 2007).¹³ In addition to this uncertainty about the effect of climate change on sequestration, the greenhouse gas emissions reductions resulting from forest conservation and management projects are often hard to quantify and verify, because of their vulnerability to human and natural

conserving and maintaining healthy forests is a natural way of storing carbon and deforestation is a major cause of greenhouse gas emissions. Furthermore, planting new trees helps mitigate climate change, by creating new storehouses for CO₂.

¹³ Studies on the impact of climate change on CO₂ absorption are mixed. Early studies showed that higher CO₂ increased growth, but a 2007 study on old growth forests in Panama and Malaysia indicated that growth was actually slowing down, not accelerating in the last two decades (Feeley et al. 2007). Warmer temperatures and higher incidence of drought due to global warming may also affect the ability of forests to absorb carbon (Clark 2004). Most recent studies show that photosynthesis has a parabolic response to temperature: slight warming can help increase plants' metabolism up to a point, after which plants take in less carbon, and respiration—the process by which plants exhale CO₂ at night—increases exponentially. Scientists believe that this point of inversion is around 26°C to 34°C, depending on the species. A study of air temperature at the tropical forest research site in La Selva, Costa Rica, showed that air temperatures already were between 30°C to 37°C on 73 percent of the days (Clark et al. 2003). In addition, increased temperature is associated with lower rainfall in tropical areas. Water stress is expected to decrease carbon intake in forests and increase forest mortality (Clark 2004).

interventions, such as illegal logging and fires, and uncertainty about the amount of carbon stored at a project level. For example, scientists were concerned that forest conservation projects might divert logging to areas outside the project area, a phenomenon known as leakage.

In the debate over the inclusion of sinks, countries joined forces based on their common national self-interests and interpreted the available science in ways that were consistent with these positions. The debate over sinks centered around two issues. First, Annex I countries fought over the inclusion of land-use activities in their baseline emissions levels and emissions reductions targets. Second, countries debated whether land-use offset projects, such as forest conservation, reforestation, and land management, should be eligible for CDM financing. As most of Costa Rica's initiatives focused on avoiding deforestation through consolidation of public lands and incentives to landowners, national negotiators focused their efforts on including avoided deforestation in the CDM.

Forming the umbrella group, GRILA, Costa Rica in alliance with most Latin American countries and some Annex I countries pushed for a broad definition of the types of LULUCF allowed by the CDM (Boyd et al. 2004).¹⁴ As with AIJ, the Annex I countries who supported an inclusive definition of land-use and forestry activities were concerned about the cost-effectiveness of Kyoto Protocol. Like Costa Rica, most Latin American countries, especially Bolivia and Colombia, saw

¹⁴ GRILA was composed of all Latin American countries except Brazil and Peru, and the U.S., Norway, Canada, and Australia.

the potential to support forestry initiatives through the international climate regime. For most Latin American and African countries, deforestation was their major contributor to greenhouse gas emissions (Trexler et al. 2000; Masera and Sheinbaum 2000). Forestry projects were not only more cost-effective than many renewable energy projects, but were closely linked to rural development, a domestic priority. By excluding avoided deforestation, they warned, the climate regime would ignore a major contributor to climate change and inhibit the sustainable development potential of the CDM (Boyd et al. 2004).

On the other side of the debate, the European Union, Russia, Brazil, China, India, and AOSIS, the coalition of small island states, argued for the exclusion of avoided deforestation (Olsen 2005). These parties argued that the inclusion of land use and forestry offset projects under the CDM would create “another big loophole in the implementation of the Kyoto Protocol” (Boyd et al. 2004; Brown et al. 2002). They emphasized the scientific uncertainty about the permanence of sink offsets which if measured inadequately or accidentally re-emitted would open the “floodgates” to “fake credits” (Fearnside 2001; Figueres 2008; Backstrand and Lovbrand 2006; Brown et al. 2002).

Like the GRILA group, domestic political interests, rather than pure science, shaped these parties positions. For example, the E.U. negotiators were concerned that the inclusion of sinks in both the CDM and Annex I commitments gave an advantage to the U.S., by decreasing its emission baseline and allowing

it to invest in cheap carbon credits from avoided deforestation instead of reforming their own practices and raising energy prices (Fearnside 2001; Babiker et al 2002).¹⁵ In 1991, one year before the UNFCCC, the E.U. had actually supported a program to conserve Amazonian rainforests, acknowledging the importance of the program to “reduce Brazilian rainforests’ contribution to global carbon emissions” (Fearnside 2001). The E.U. had reversed this position because it believed that by excluding forests in CDM, the U.S. would be forced to raise the price of fossil fuels through a carbon tax; the higher energy price would lessen the US’s comparative trade advantage (Fearnside 2001). Similarly, Brazil maintained a contradictory stance on the inclusion of sinks, supporting the inclusion of reforestation projects but opposing avoided deforestation. Many theorize that Brazil feared that the inclusion of avoided deforestation would threaten their sovereignty over land use decisions in the Amazon, while reforestation credits could be used to support their growing commercial plantation business (Fearnside 2001).

From 1997 to 2001, the parties fought over the inclusion of land-use activities in the CDM. In July 2001, the U.S. officially dropped out of the negotiations fundamentally changing the power dynamics in the negotiations.

¹⁵ Setting baselines is always controversial, as they establish the standard against which all future reforms are measured. By including LULUCF activities in Annex I baselines and in later emissions reductions, the U.S. could argue that its emissions footprint was actually lower than when only energy emissions were considered, and that over the course of the 1990s it had reduced its carbon footprint substantially through changes in land management and reforestation activities. In addition, if LULUCF was included in the CDM, the U.S. could continue to burn fossil fuels and buy up cheap credits for forestry activities from developing countries. The E.U. feared that both the inclusion of LULUCF in Annex I baselines and obligations and in the CDM would ease the U.S.’s obligation to reduce emissions from energy use and thus raise energy prices. Energy prices are much higher in the EU, which places them at a disadvantage in competing for international industrial markets.

According to Article 25, the Kyoto Protocol only enters into force after Annex I countries responsible for 55 percent of the total carbon dioxide emissions for 1990 sign the treaty. This provision was intended to ensure that large emitters become part of the Kyoto Protocol, in order to make a meaningful impact on addressing climate change. When the U.S. dropped out of the negotiations, however, this provision gave Japan, Russia, Canada, and Australia significant power to demand the inclusion of sinks in Annex I baselines and commitments.¹⁶ In order to garner these countries' support, the E.U. agreed to allow Annex I parties to determine for themselves what part of their baseline and commitments could come from sinks (Höhne et al. 2007; Bettelheim and D'Origny 2003). In exchange, these developed parties agreed to restrict the scope of sinks in the CDM (Bettelheim and D'Origny 2003).

This compromise shaped the outcome of the debate over the CDM. Although Costa Rican negotiators tried to demonstrate the use of techniques to reduce scientific uncertainty about the permanence of natural sinks, after the U.S. dropped out of the Kyoto Protocol negotiations, Costa Rica lost its strongest ally in the debate. Moreover, Brazil continued to maintain a strong stance against the inclusion of avoided deforestation. According to Cristiana Figueres, Brazil's continued opposition divided the G-77 and ultimately led to the exclusion of forest conservation for developing countries (Figueres 2008).

¹⁶ The E.U. essentially had to compromise on many of its early demands in order to get the treaty ratified by the required number of parties.

In their final decision, outlined in the 2001 Marrakesh Accords, parties agreed to allow only reforestation and afforestation (reforestation on lands which were not previously forested) in the CDM for the first commitment period from 2008-2012.¹⁷ This meant that only new tree plantings activities could be counted towards Annex I countries' emission reductions credits through the CDM. In addition, these credits could only make up one percent of Annex I countries' emissions reductions. In contrast, parties agreed to include land-use activities such as forest, cropland and grazing-land management in Annex I countries baselines and project activities (Boyd et al. 2004; Höhne et al. 2007). In fact, Annex I countries could jointly implement forestry and land-use projects with other developed countries, where emissions were less costly. For example, France could implement a forest management project in Romania and receive the credits.

The Marrakesh Accords thus allowed industrialized countries to count land-use activities towards their emissions credits, as long as they did not come from developing countries.¹⁸ Reforestation credits from developing countries were further discouraged through the one percent limit. The Prime Minister of Papua New Guinea, a South Pacific rainforest state, highlighted the inequity of the decision:

¹⁷ Although the COP6 began in November 2000, disagreements over LULUCF caused the conference to be adjourned without an agreement. The negotiations resumed in November 2001, which is referred to as COP6-bis (Höhne et al 2007).

¹⁸ In fact, Joint Implementation allowed Annex I countries to implement forestry and land-use projects with other developed countries, where emissions were less costly (i.e. France could implement a project in Romania) and receive the credits.

The Kyoto Protocol specifically provides incentives for industrialized countries to reduce deforestation. However, for developing countries, the Marrakesh Accords have subsequently slammed that door shut. Developing Nations are again exploited and effectively forced to conserve the remaining Rainforests for FREE! This defies justice! More importantly, history shows it will not work! (Somare 2005).

Many scientists agreed with Prime Minister Somare. They noted that the scientific uncertainty about avoided deforestation could easily be dealt with by monitoring national inventories of forests within developing countries, and through a host of other measures which would be required for reforestation credits anyway (Swingland 2003; Fearnside 2001; Boyd et al. 2004). According to Philip M. Fearnside, a tropical forest ecologist, the decision to exclude reforestation was not scientific but moral: "Science can provide answers such as 'how much carbon will a given project hold out of the atmosphere, for how long and with what degree. It cannot tell us whether that answer means that the CDM should include or exclude avoided deforestation. Such a conclusion requires moral choices" (Fearnside 2001).

In fact, these choices were not moral, but rather based on competing domestic political interests. Their moral consequences however highlight the shift in the power dynamics and alliances after the U.S. dropped out in 2001.

In Costa Rica, the decision to exclude avoided deforestation, coupled with the failure to secure financing during AIJ for the Protected Areas Project, precluded the government's plan to finance its two programs—the ecosystem service payments and national park consolidation—through the international climate system. Most Costa Rican initiatives were focused on forest conservation. Of the five AIJ projects, four include conservation as a large portion of emission credits, including the two that had already been financed (UNFCCC n.d.). Most of the areas targeted by the GRUAS report for national park consolidation were already forested. Even the incentive program appeared to favor conservation over reforestation. The 1996 Forestry Law had established fixed payments for different forestry activities. FONAFIFO paid landowners to conserve forests \$43 per hectare per year over a five year period, compared to \$27.25 per year over a 20 year period for commercial reforestation (Pagiola 2006). By the end of 2001, 82.5 percent of the 200,000 hectares financed through the PSA were for conservation and 10.2 percent for forest management, both now excluded under the CDM. Only 7 percent of the contracts were reforestation for commercial purposes (Pagiola 2002).

Adapting to the Decision: New Funding and Reforms

Moving forward, Costa Rica looked for new sources of financing for its

conservation efforts and tried to create a demand for reforestation credits in order to take advantage of the CDM. This new funding helped strengthened Costa Rica's landowner incentive program and FONAFIFO's administrative and technological capabilities – reforms that would help Costa Rica tackle the requirements of the CDM. In the process of this strengthening, however, the Costa Rican government abandoned its efforts to consolidate the national park system.

From 1996 to 1998, the \$2 million from the certified tradable offsets (CTO) sales to Norway was used to cover the first environmental service payments made in Costa Rica. Although the 1996 Forestry Law allocated one-third of the 15 percent tax on gasoline to the environmental service payment program, a sum equivalent to \$25 million during its first 15 months of its initiation, conflicts between the ministry of finance and FONAFIFO during the Miguel Angel Rodriguez administration impeded the distribution of these funds (de Camino et al. 2000). In July 1997 private forestry groups threatened to block the inter-American highway as a show of solidarity to FONAFIFO (FONAFIFO 2005). After extensive negotiations, the Ministry of Finance agreed to allot \$6.5 million to the program, and in 2000 the Legislative Assembly agreed that 3.5 percent of the future proceeds from the gas tax would go to FONAFIFO. Generating an average of \$10 million dollars annually, the gas tax would provide the bulk of FONAFIFO's financing over the years and allowed it to continue the activities

outlined by the early reformers (Pagiola 2006).

After securing payments from the gas tax, FONAFIFO also began to investigate international sources of funding to support its forestry initiatives. The World Bank had always favored FONAFIFO's market-based approach to conservation. In a series of reports from 1993 to 2000, World Bank scholars had helped Costa Rica estimate the value of its environmental services, which helped form the basis of the PSA program. Even though Costa Rica had been enthusiastic about the potential for international carbon financing based on this 1993 World Bank report, more recently Bank officials had encouraged Costa Rican officials to diversify their sources of financing, given the uncertainty surrounding the negotiations of the Kyoto Protocol. They called on FONAFIFO to identify local consumers of environmental services, such as hydroelectric plants and tourist facilities, and focus on creating markets domestically (de Camino et al. 2000). To help support this initiative, in 2000 the World Bank agreed to loan FONAFIFO \$32.6 million. The Global Environmental Facility (GEF) tacked on an \$8 million grant that targeted private lands adjacent to both national parks and biological reserves in the Mesoamerican Biological Corridor that connects Panama and Costa Rica (World Bank 2000).

The goal of the Ecomarkets loan and grant was to help Costa Rica meet its commitments to private landowners for environmental services payments while the government looked for long-term financing mechanisms for the

program. In addition, the loan could be used to help develop the technical and administrative capacity of the environmental service payment program. Costa Rica used these funds to help improve the outreach and scope of the PSA program.

Studies of the early landowner program indicated that FONAFIFO was not meeting many of its social and environmental goals. For example, in her study of the Norwegian financed AIJ project, Susan Subak noted that conservation payments had contributed little to either equity or biodiversity. Most payments had gone to large wealthy property owners; lands remained degraded and only red alder, a species with few wildlife benefits had been extensively planted (Subak 2000).

To increase poor landowner participation, FONAFIFO created a global contracting system that enables groups of small landowners to join the program under one user agreement. This system defrays the cost of enrollment and verification. FONAFIFO also simplified enrollment requirements to allow untenured farmers to receive payments (FONAFIFO 2005; Pagiola 2006). Administrative changes helped bolster these equity measures. In 2003, FONAFIFO created eight regional offices to increase its outreach to landowners. Previously, it had depended on the national conservation system and local organizations to contract new enrollees. The new decentralized system allowed FONAFIFO to maintain a tighter control over resources. Staffed with local

forestry officials, known as regentes, these new regional offices conducted outreach, helped landowners develop land use plans, and verified activities on the ground.

FONAFIFO also expanded its technological resources to help address the ecological shortcomings of the program. In 1996, using some of the Norwegian funds, Costa Rica had developed a series of “striptease” maps showing changes in land cover over the course of the century. This baseline data and the GRUAS report allowed FONAFIFO to identify priority areas for biodiversity, watershed, and scenic beauty that were deforested or unprotected (FONAFIFO 2005).

FONAFIFO also developed a tree database, which allowed local offices to choose from thousands of species in their bioregions and find local suppliers (Herrera Ugalde 2008). These efforts helped FONAFIFO improve its outreach; however, the 1996 law required the agency to enroll landowners on a first-come-first-served basis, not based on the quality of the land, as an equity measure to prevent preferential treatment (Pagiola 2006).¹⁹ Nonetheless, these reforms—the decentralized verification system, maps and database—built up FONAFIFO’s technological and administrative capacities and gave Costa Rica an advantage over many developing countries in meeting the CDM requirements.

In addition to these reforms, FONAFIFO looked to develop domestic markets for ecosystem services. Using the certified tradable offset (CTO)

¹⁹ This rule was likely a political decision to get approval from different legislators and interest groups.

model, FONAFIFO created a uniform certification system for environmental service payments for voluntary service agreements. Instead of buying carbon offsets, however, companies that purchase Certified Environmental Services (CSAs) agree to pay not just for the price of carbon or other services but for the full cost of environmental service payments corresponding to one hectare of conservation, reforestation or management in a specified area (Pagiola 2006).²⁰ At the time, these CSAs and the CDM remained the centerpieces for FONAFIFO's strategy to finance its environmental services program.

The World Bank loan helped sustain and improve Costa Rica's landowner conservation payments at a critical time for Costa Rican environmental advocates. The exclusion of avoided deforestation had almost bankrupted the reforms made in the 1990s. Moreover, in 1998 the Social Christian Party (PUSC) won the national elections, removing Figueres's National Liberation Party (PLN) from power. Most of the environmental advocates who had played an important role shaping the 1996 Forestry Law, such as Janzen, Tattenbach and Castro, lost the ear of the government. Yet the PSA program was able to survive because of its new sources of funding. Paradoxically, however, the World Bank loan, coupled with the exclusion of avoided deforestation, limited the original scope of Costa Rica's forestry reforms by influencing the new government to abandon the efforts to consolidate the national park system due to

²⁰ CSA stands for Certificado de Servicio Ambientale.

lack of financing. In fact, since 2000 the Costa Rican government has focused solely on enhancing the incentive program (Janzen 2008).

Costa Rica Prepares for the CDM

In addition to these general reforms financed through the World Bank loan, FONAFIFO also tried to increase demand for reforestation incentives in order to take advantage of the CDM. Although it was disappointed about the exclusion of avoided deforestation in the international mechanism, FONAFIFO nevertheless hoped to use the CDM to increase to the country's forest cover to its 70 percent goal. Reforestation had always been part of Costa Rica's sustainable forestry strategy; until 2003, however, reforestation incentives had mainly been focused on commercial wood production. Commercial production incentives helped meet the local demand for wood, prevent illegal deforestation, and provide income to small and medium sized landowners. It was also supported politically by the country's commercial sector.

Those receiving reforestation payments had mixed feelings about the incentive program, however. A 2004 survey of landowner satisfaction in the region of Huetar del Norte found that reforestation payment barely allowed recipients to survive. Almost all of the proceeds were used for start-up and compliance costs. Timber sales from thinning and final harvest were sufficient to meet landowners' long-term needs. To be financially viable in the interim,

however, reforestation had to be combined with other income-generating activities, such as cattle raising and agriculture (Miranda et al. 2004).

FONAFIFO tried to address landowners' concerns by introducing new activities and raising incentive payments. In 2006 the Legislative Assembly agreed to increase payments from \$550 per hectare distributed over five years to \$816 distributed over 10 years. As landowners were required to maintain trees for a total of 20 years, either by planting new ones or waiting to harvest them, this net increase amounted to \$13 per year. In order to help support farmers and attract new landowners to the program, FONAFIFO introduced two new payments: agroforestry as an additional income generating activity and natural regeneration, which is less costly and time consuming to implement (Pagiola 2006). In addition, it launched a number of pilot projects to test their feasibility.²¹

Building on these reforms, in 2005 Costa Rica submitted CoopeAgri, its first project, to the CDM Executive Board. It is a large-scale project, based on small 60-hectare parcels from over 600 landowners, most of who have been involved in ranching and agriculture. It addresses equity goals by providing long-term livelihoods through agroforestry and commercial non-native species

²¹ A notable example is the pilot agroforestry carbon project in the indigenous territories of Bribri and Cabecar tribes. FONAFIFO had originally enrolled individual tribal members. After it raised concerns about corruption and land ownership, however, it began to work exclusively with the communal development organizations, ADITICA and ADITIBRI. These tribal associations identify priority lands that met their collective goals and distribute profits based on consensus decision of the association. In addition, part of the payments are used to create a sustainable development fund for future projects (Rojas et al. 2007). ADITICA and ADITIBRI agreed to engage in a carbon forestry pilot to gauge interest in using carbon payments as part of their rural development strategy. CATIE, a tropical research center, held meetings to help tribal members understand the dynamics of carbon sequestration. It trained indigenous farmers to monitor tree growth and carbon capture. The agroforestry project also shelters organic cacao plantations, as part of the broader rural development strategy. Through this partnership, FONAFIFO has financed the restoration of 16,700 hectares of forest and the planting of 118,000 trees for agroforestry (Rojas et al. 2007; Sheck 2006).

reforestation. It addresses environmental goals through natural regeneration in an area with high erosion attached to a watershed, replacing illegal logging of natural forests (The World Bank Carbon Finance Unit 2008). In 2004 the World Bank selected CoopeAgri as one of the 20 projects eligible for funding for its Biocarbon fund, a pilot fund to boost CDM forestry projects. The fund both provided Costa Rica with start up capital and technical assistance to meet the CDM standard and guaranteed to buy all of the carbon credits for the project at the fixed price of \$2.207 million (The World Bank Carbon Finance Unit 2008). The only requirement was that the CDM Executive Board had to approve and register the project (Herrera Ugalde 2008). Although this appeared simple, registering CoopeAgri proved to be more difficult than Costa Rica anticipated.

The Rules of the CDM: Dealing with Scientific Uncertainty

Although the CDM was intended to link climate change with sustainable development, the long and technical process focuses solely on incremental carbon uptake. These rules—the creation of baseline dates, proof of additionality, leakage prevention, and temporary crediting system—were developed to ensure that the climate development mechanism contributed to the goal of the Kyoto Protocol through a net reduction in greenhouse gas accumulation. Scientists in collaboration with policymakers created the rules to address concerns about scientific uncertainty and ensure that moneys invested

would not be wasted. Unintentionally, however, this focus on minimizing uncertainty makes it difficult for developing countries to use the mechanism to finance their sustainable forestry reforms.

To get a project registered and approved, a project developer first submits a short project idea notice (PIN) to the CDM Executive Board that describes the project and shows that the host country has agreed to the project. Using an approved or new methodology, the developer must then complete a technical submission, which outlines how the project expects to reduce emission. An external verifier, called the Designated Operational Entity, reviews the project and submits its recommendations to the Executive Board, which either agrees to register it or not. Once registered, projects compete for buyers from industrialized countries, who purchase the carbon credits for a negotiated price to meet their emissions commitments. This process usually takes between four months and two years (Pearson et al. 2006; CATIE 2007).

The actual language of the Kyoto Protocol on the CDM is quite vague about the requirements of projects: emissions reductions must be “real, measurable, and long term” and “additional to any that would otherwise have occurred” (Article 12). But, CDM rules are quite specific about methods of calculating emissions, proving additionality, and ensuring longevity. To qualify as a carbon offset, projects must demonstrate that emissions will be lower than under a business-as-usual scenario. This proof of “additionality” ensures the

environmental integrity of the mechanism, by guaranteeing that projects financed through the CDM actually reduce greenhouse gas emissions. In order to show additionality, project developers must establish a baseline scenario, which is used to compare the greenhouse gas emissions from the land use before and after a project is implemented. Higher emission baselines typically mean that a project will generate less carbon credits. For example, a cleared area that has been used for cattle production has a higher emission baseline, than one used for planting crops. Similarly, projects that use fast-growing species, like eucalyptus, are likely to generate more carbon credits, than native forests with slower-growing species.

Although this method of calculating emissions baselines is meant to ensure that CDM financed projects actually reduce greenhouse gas emissions, it also creates a perverse incentive to cut down existing forests and replace them with non-natives. In order to prevent this, parties agreed to a baseline date of December 31, 1989, the date from which Annex I countries commitments are calculated. Areas deforested after this date are not eligible to be CDM projects (Boyd et al. 2004; Höhne et al. 2007).

In addition, the agencies in charge of developing CDM guidelines for afforestation and reforestation projects also developed a number of supplementary guidelines to ensure that funds would not go to projects that

would have occurred without CDM financing.²² Project developers must demonstrate that reforestation was not already a financially attractive course of action at the time when the project started. This proof of “financial additional” had already been adopted for energy projects and is common for environmental aid, as donors want to ensure that their funds are not being wasted on projects that would have already occurred (Keohane 1996). Similarly, existing national and sectoral policies that may affect land-use decisions also must be taken into account. Curiously, instead of selecting the same year as the ones chosen for eligible lands, the A/R CDM Working Group decided that the date for national policies to be considered should be November 11, 2001, the year that parties agreed to include reforestation and afforestation in the CDM (Pearson et al. 2006; CDM Working Group 2003). This meant that for every project countries had to prove that forest policies implemented before November 11, 2001 did not positively influence reforestation (CDM Working Group 2003).²³

To address scientific concerns about the long-term benefits of natural sinks, scientists and policymakers developed strategies to prevent leakage and ensure permanence. Leakage occurs when events outside a project boundary affect the net carbon reduction. For example, negative leakage can result when reforesting one hectare of land diverts illegal logging to other areas of the forest.

²² The two main groups in charge of shaping and reforming the CDM reforestation guidelines are the Subsidiary Body for Science and Technical Advice (SBSTA) and the Afforestation/Reforestation (A/R) CDM Working Group.

²³ The CDM ruling actually states that policies instituted after November 11, 2001 shall not be considered in baseline scenarios. “National and/or sectoral land-use policies or regulations, which give comparative advantages to afforestation/reforestation activities and that have been implemented since the adoption by the COP of the CDM M&P (decision 17/CP.7, 11 November 2001), need not be taken into account in developing a baseline scenario.”

Positive leakage occurs when areas outside the project boundaries switch to forests. In order to prevent leakage, parties are supposed to develop national policies to prevent displacement of deforestation. In the negotiations leading to the formation of the rules, Latin American countries pushed to allow for positive leakage to count towards their emissions credits, but this proposal was rejected (Höhne et al. 2007).

Because scientists believe that trees do not store carbon permanently, the A/R CDM Working Group also created two new categories of carbon crediting for forestry projects: temporary Certified Emissions Reductions (t-CERs) and long term Certified Emissions Reductions (l-CERs). Unlike energy credits, which count as permanent emissions reductions, t-CERs and l-CERs expire, and therefore only delay the need to reduce emissions. After the project expires, buyers need to replace them with new temporary credits, permanent credits (CERs) from energy projects, or their own emissions reductions; otherwise the emissions will be counted against them. Furthermore, emissions reductions of reforestation projects must be verified more frequently than those for energy (every five years, compared to every 10 years for energy projects).

Latin American countries opposed this system of accounting. Colombia submitted a proposal that would make the credits temporary only if the project area was deforested. To help build consensus, Canada proposed that all CDM approved projects become protected areas, thus guaranteeing permanency of

tree plantings. Both of these proposals were rejected in favor of temporary credits. Although this system of crediting ensures that emissions are reduced in the long term, it also means that the market value of forestry credits is lower than that of energy projects because they are temporary, and that the liability for guaranteeing credits rests on developing countries (Pearson et al 2006; Boyd et al 2004). For example, buyers of t-CERs are only contractually obliged to provide financing for five years, after which they can choose to renew the transaction. If they do not, however, the project developer, which is typically in the developing country, must find a new buyer. While buyers of I-CERs are contractually obliged to make payments for 20 years, if the carbon generated is lower than expected, the project developer in the developing country must replace the difference through credits that are banked as liability payments (CATIE 2007; Pearson et al. 2006).

Costa Rica Tries to Meet the CDM Requirements

By focusing principally on calculating incremental carbon uptake and minimizing uncertainty, the CDM rules make it difficult for developing countries to participate in the regime. One of the main reasons for this difficulty is that developing countries lack the technical and administrative capacity to participate effectively in the regime. This was not the case for Costa Rica. Although one would expect Costa Rica to have an advantage at meeting CDM requirements due to its

developed conservation bureaucracy and increase in forest cover, the rules of CDM unintentionally penalize Costa Rica for its early reforms.

By the time the CDM rules were in place in 2005, Costa Rica already had developed institutions, inventories, and procedures that helped it meet the complex requirements of the CDM. While many developing countries protested the restriction on reforestation for lands deforested before 1990 because they had not inventoried their land, Costa Rica's land-cover tracking system allowed FONAFIFO to identify 1.1 million hectares of potential lands eligible under the CDM and to develop several projects for CDM consideration (Pagiola 2006). Working with local universities, FONAFIFO was expanding the carbon sequestration data for species in its tree database (Herrera Ugalde 2008). Moreover, FONAFIFO already had a system of verification, permanence, and leakage prevention in place. It had a trained workforce of forestry officials who verified tree growth and cover on private lands. FONAFIFO's incentive contracts had always required landowners to implement sustainable forest management plans, such as instituting fire breaks and preventing illegal logging, which help ensure the permanence of planted trees. The 1996 law's prohibition on land-use changes in forested areas and satellite monitoring helped prevent leakage as well. Given that these practices and institutions already existed, the need for learning and the cost of compliance with CDM rules was smaller for Costa Rica than for other countries that did not have existing programs.

On the other hand, Costa Rica's advantages were counterbalanced by the rules for proving additionality. Because it had passed its national forestry policy during AIJ and not after the agreement on sinks, Costa Rican officials had to prove that its earlier reforms, particularly the PSA program and prohibition on land-use changes, did not give " a comparative advantage to afforestation/ reforestation activities" (CDM Working Group 2003). FONAFIFO had intended to sell carbon credits for existing projects that had been reforested through the private landowner program. It assumed it could pay landowners first and then sell the carbon credits retroactively. But the CDM's choice of dates and proof of financial additionality prohibited such retroactive payments (Pagiola 2006; Tattenbach 2008).

Moreover, the rules of the private landowner program made it difficult to show financial additionality (Tattenbach 2008). The 1996 Forestry Law requires FONAFIFO to pay landowner the same fixed sum for reforestation and conservation, regardless of the value of the land, its biological importance, or any other factor. This makes it difficult to attract landowners who engage in activities that have higher revenues than the payment and attracts those engaged in activities with a lower opportunity costs and those that are unprofitable. For example, in the Virilla region, where the Norway AIJ project is located, FONAFIFO struggled to enroll dairy farmers compared to export meat producers because the dairy cooperatives were doing very well, while international meat

prices had dropped (Subak 2000). In the latter case, FONAFIFO had a hard time proving that the PSA payments directly influenced landowners to reforest an area, since their alternative was unprofitable to begin with.

Some studies have found direct links between the landowner payments and reforestation, but others conclude that the payments go to support activities that would have occurred without the financial incentive. A study in the Central Volcanic Region by Tattenbach, the former head of OCIC, claims that the private landowner program is responsible for a 10 percent increase in forest cover (Tattenbach et al. 2006). In a 2004 landowner survey, 43 percent of those enrolled in the PSA program claimed that they had abandoned agriculture and pasture when incentive was offered as an option (Sierra and Russman 2006). Moreover, Tattenbach points out that many areas adjacent to landowners enrolled in the program also increased their forest cover (Tattenbach et al. 2006). He argues that these landowners shifted activities early in anticipation of receiving conservation payments in the future. In their country-wide study of the ecosystem service payment program, however, Pfaff and Robalino argue that the program actually subsidizes activities in areas that would likely have been reforested and conserved without the funding, because the 1996 Forest Law prohibited land-use changes in forested areas, and pasture and agriculture have become less profitable (Pfaff et al. 2007). They point to these conversions without payments as evidence that the PSA has little impact on landowner

decisions to convert lands. In short, because of existing laws, economic changes in land values, and the fixed nature of the PSA payments, Costa Rica has a hard time proving that landowners would not have reforested their areas without the incentive.

Interestingly, despite disagreements over how it has happened, all of these studies indicate that Costa Rica has been increasing its forest cover and decreasing deforestation. Ironically, though, the rules of CDM do not reward Costa Rica for increasing its forest cover. Instead they penalize the country for not being able to prove that the 1996 Forest Policy did not influence the change and that the PSA payments did not directly stimulate the reforestation. Given that the CDM is intended to help address climate change, judging Costa Rican projects based on an arbitrary historical baseline and financial additionality appear somewhat trivial.

In fact, in June 2007 the CDM Executive Board rejected the original methodology used for Coopeagri for the third time, mainly for technical errors in setting baselines, calculating net carbon benefits, and proving additionality (A/R Working Group 2006; Herrera Ugalde 2008). This decision forced Costa Rica to reformulate its entire 300-page Project Proposal and resubmit it to the CDM Executive Board. Making matters worse, Costa Rica had already used the same methodology to calculate emissions for two other projects, which it would have to redo. Although FONAFIFO is contractually obliged to resubmit Coopeagri, it is

now considering launching its other projects on the international voluntary market, which uses a less rigid definition of additionality, rather than through the CDM (Herrera Ugalde 2008).

CDM: An Unintentional Barrier to Sustainable Development

The CDM's inadvertent penalization for early reforms reflects a conflict between the CDM rules and the goals of forest advocates in developing countries.

Although the CDM is supposed to help developed countries meet their Kyoto commitments in a cost-effective way and developing countries develop sustainably in tandem, the rules of the CDM favor the interests of developed countries. Not only is it more difficult for developing countries to implement offset projects than developed countries, but the weak mechanism also creates a disincentive for countries to link climate change with sustainable development.

The main objective of the CDM is to contribute to a net reduction in greenhouse gases in the atmosphere by helping developed countries achieve their Kyoto Protocol commitments in a cost-effective way. In addition, the CDM is supposed to help non-Annex I parties develop sustainably. While the mechanism is supposed to meet these goals in tandem, the guidelines for scenario baselines, national policies, financial additionality, and impermanence were designed solely to ensure that funding stimulates projects that have a net effect on greenhouse gas accumulation. But forest advocates are interested in

other benefits of increasing forest cover, such as protecting biodiversity, improving water quality, and alleviating poverty by generating income—all of which are closely tied to promoting sustainable development in developing countries. Their priority is to support projects that combine these benefits, regardless of when and how they arose.

The conflict between carbon storage and sustainable development was caused in part by a decision made during the international negotiations. The G-77, including Costa Rica, fought hard against requiring a socioeconomic and environmental assessment to judge the benefits of forestry projects because it would limit their sovereignty (Boyd et al. 2004). Instead, the CDM leaves it up to the host party to decide whether a project actually contributes to its sustainable development. Because of this decision, the CDM approves forestry projects based solely on carbon sequestration, and the market value of carbon forestry projects is based solely on capture.

In addition, the scientific uncertainty underpinning the negotiations influenced scientists and policymakers to shape and enforce policies that would guarantee the integrity of the mechanism. Because developing countries do not have emissions targets of their own, the CDM functions solely as a mechanism by which developed can finance projects in developing countries that reduce emissions. Although the baseline dates chosen are somewhat arbitrarily, scientists who validate CDM applications focus on measuring net increases in

sequestration from a historical baseline. Their priority is not to examine general reforestation trends in a country but rather to make sure that the money invested in developing countries is the principal impetus for reforestation.

Scientific uncertainty is clearly not the only driver, however, because many of the CDM provisions are much more complicated than those laid out for Joint Implementation between developed countries. Not only can developed countries implement a wider range of forest and land-use projects jointly, but they do not have to submit a project design document to a central entity or get projects validated and registered with one. Moreover, they did not have to take into account national policies or use a temporary crediting system (Bettelheim and D'Origny 2003). The end result is that it is actually more difficult, costly and time consuming to submit a project to the CDM than to develop forestry projects jointly in developed countries.

This added complexity of the CDM compared to Joint Implementation between developed countries highlights the extent to which science has been used as a foil for countries' political interests in the creation of incentives for forestry in the Kyoto Protocol. According to Bettelheim and D'Origny, in the intense effort to reach an agreement over the Protocol, negotiators forgot that "climate does not care where or how atmospheric concentration of CO₂ are reduced" and created rules that made the value of forestry offsets lower in developing countries (Bettelheim and D'Origny 2003).

The complexity of the CDM rules and process, coupled with the sole focus on carbon capture, detracts both from the goals of forest advocates and the goal of promoting sustainable development. In Costa Rica's case, the arbitrary dates mean that the CDM does not count the global benefit of Costa Rica's early action. Although Costa Rica has increased its forest cover, it struggles to prove that the CDM funds directly stimulated this change.

Although the CDM rules have a uniquely bad effect on Costa Rica, they have more general impacts on developing countries and the types of projects they create. First, the long, centralized process and high cost of CDM verification and approval—estimated at between \$30,000 and \$100,000—may dissuade developing countries from participating in the CDM. Because these upfront costs are not reimbursed, if the project is rejected, developing countries take on a large financial risk in creating a CDM project (Anonymous 2007; Pearson et al. 2006).²⁴ Second, those who do submit projects have an incentive to cut out other social and environmental benefits in order to maximize sequestration and cost-effectiveness. Because the CDM only places a value on carbon capture, other ecosystem and social services are not valued in the price of carbon offsets and are often perceived as expendable. Project developers have an incentive to keep costs down in order to compete for buyers on the CDM market. Low-cost credits typically win out, given that most investors are more concerned with

²⁴ The CDM Executive Board is also underfinanced. This is one of the sources of the long waiting periods.

compliance than promoting sustainable development. For example, landfill methane capture projects are the most popular CDM energy projects because they generate many offsets at a low cost; however, they do little to promote economic development and have few local environmental benefits for the host country (Olsen 2005; Point Carbon 2008). The temporary nature of forestry credits also means that the offering price and demand are lower for forestry offsets (Olsen 2005).

In addition to these financial deterrents, the rules of the CDM may actually promote forestry projects that are not sustainable in the long run. For example, the focus on carbon quantification provides a perverse incentive to plant fast-growing commercial species in order to maximize the net carbon capture (Subak 2000; Olsen 2005). In fact, the only CDM reforestation project approved to date uses eucalyptus as a renewable source for paper production in China (UNFCCC 2008). The absence of carbon-uptake data for many native species results in forestry projects that are less diverse than natural forests. Non-tenured farmers cannot participate in the program, due to CDM concerns about permanence (Herrera Ugalde 2008). Small-scale projects, in which low income communities are more likely to participate, are prohibitively expensive to administer (Locatelli and Pedroni 2006).

For example, in a long-term study of a carbon-forestry program in Chiapas, Mexico, researchers found that the original goals of community

development, biodiversity protection, and carbon sequestration were decoupled over time. Initially, the community-based agroforestry program used a variety of species and had distributed power between researchers and farmers. But within three years, the program had become focused on generating revenue from carbon sequestration. Those who sold the carbon on the international market became the sole decision makers, and species diversity was reduced to two fast-growing species (Nelson and de Jong 2003).

Evaluating Costa Rica's CDM Projects

Despite the general push for low-cost projects, an evaluation of the Costa Rican projects proposed for CDM suggests that the country has not compromised the ecological and social goals of its PSA program. In fact, FONAFIFO's institutional structure and financial independence enable Costa Rica to implement projects that benefit the local environment and stakeholders.

The seven projects proposed for the CDM involve 1,174 poor, rural communities, including six indigenous groups. Despite the incentive to plant fast-growing plantations, FONAFIFO is looking to combine at least a 50-50 mix of native and non-native vegetation for all its CDM projects (Herrera Ugalde 2008). Of the 29,000 hectares earmarked for CDM financing, 20,100 hectares are for natural forest regeneration.²⁵ The remainder provide additional income for

²⁵ Authors calculation based on press releases. Total is based on only six of the CDM projects as there is no data breakdown for the Zona del Norte project.

landowners through commercial forestry and agroforestry.

Examples of Costa Rica's proposed CDM projects illustrate the FONAFIFO's determination to fuse carbon sequestration with other social and economic benefits. The Los Santos project aims to involve bulk coffee growers, who have suffered economically as a result of fluctuations in the coffee market. The project aims to reforest 3,000 hectares of land naturally, and diversify farmers' economic activities by developing 300 hectares of commercial plantations and planting 105,000 tree to develop a niche market for shade grown coffee. The Dikes I & II projects target indigenous communities – the Cabagra, Ujarras, and Salitre on the Pacific Coast and the Brunka descendents in Puntarenas—to help reforest degraded watershed areas and provide alternative livelihoods to grazing and agriculture through agroforestry. Only 44 percent and 12.3 percent of their lands respectively remain forested. The projects seek to reforest 7,500 hectares with natural regeneration and plant 210,000 trees for agroforestry (FONAFIFO 2008).

These efforts highlight the strength of FONAFIFO's institutional structure and its financial independence. FONAFIFO's institutional mandate requires it to develop projects that fuse environmental and social benefits. The agency's centralized decision-making structure allows it to develop priorities at the national level, instead of relying on private developers to submit plans to prove that CDM projects contribute to the country's sustainable development. To this end,

FONAFIFO is currently in the process of identifying lands eligible for the CDM that maximize other ecosystem benefits, such as biodiversity and watershed protection. In addition, the 1996 Forestry Law ensures that most of the revenues generated through ecosystem service sales go to landowners in the form of payments. FONAFIFO legally may only use five percent of its revenue for administrative costs (Pagiola 2006). Between 87 and 97 percent of the revenues generated from carbon sales for CDM projects will be used to pay landowners in the area where the carbon is generated (FONAFIFO 2008).

Finally, the pressure to develop cost-effective projects does not affect FONAFIFO, as it would other project developers. The decision to exclude avoided deforestation from the CDM forced FONAFIFO to diversify its funding sources. Ironically, this shift has given FONAFIFO independence to create projects that meet its social and environmental goals, rather than compromising those goals to attract CDM investors. If the CDM Executive Board rejects the projects, or it cannot find buyers at its minimum price, FONAFIFO has other financing options. In fact, according to Maria Elena Herrera Ugalde, head of finance at FONAFIFO, regardless of what happens with the CDM board of approval, FONAFIFO will implement all of its seven projects (Herrera Ugalde 2008).

In sum, the CDM fails to provide adequate incentives for developing countries either to address deforestation or to influence sustainable reforestation.

Not only do the rules inadvertently penalize Costa Rica for its early reforms, but they also lower the market value of forestry offset projects and create a perverse incentive for developing countries to create projects that maximize carbon sequestration at the expense of other benefits. Although Costa Rica expected that mandatory compliance would give an incentive to developed countries to support forestry in developing country, the exclusion of avoided deforestation, the rigidity of CDM rules especially in comparison to those for developed countries, and the high cost of certification made it close to impossible to finance its forestry reforms through the official international climate policies.

THE INTERNATIONAL VOLUNTARY AND DOMESTIC CARBON MARKETS

Given the failure of CDM to address avoided deforestation and the difficulty of getting reforestation projects approved, Costa Rica has looked for new ways to leverage international concern for climate change to finance its sustainable forestry. The international voluntary market, with its flexible rules, growing size, and conservation-friendly buyers, offers a new opportunity to generate funds from the international community. But to date, the low price of offsets and uncertain demand make it difficult to rely on this market to finance forestry projects. Instead, Costa Rican policymakers have launched a national campaign to be the first carbon-neutral country, hoping to stimulate the country's domestic

market for own forestry-offsets. This effort highlights the shift in Costa Rica's financing approach for forestry away from an international, market-based approach towards one that relies primarily on domestic regulation.

The Voluntary Carbon Market: Some Hope for the Future

Unlike the rigid CDM, the international voluntary market with its growing size, flexible rules, low transaction costs, and conservation-friendly buyers, provides an opportunity for Costa Rica to generate funds from the international community. In fact, Costa Rica's early reforms and its political stability make it a favorite of investors. Although these attributes make it easier for countries to use the voluntary market, the absence of a mandatory cap means that the demand for offsets is unpredictable and their value is low.

Since Costa Rica first placed its "certified tradable offsets" (CTOs) on Chicago Board of Trade in 1998, the U.S. voluntary market has burgeoned into a multi-million-dollar industry. From 2006 to 2007 the voluntary carbon market more than doubled, trading more than 55 million tons of CO₂ by the end of 2007. Although it makes up only 15 percent of the mandatory emissions traded in the EU, the U.S. market is expected to grow exponentially in the coming years as companies invest in offsets to prepare for future regulations (Bayon et al. 2007; Point Carbon 2007).

Voluntary markets, unlike the regulatory ones institutionalized in the Kyoto

Protocol, do not count towards mandatory compliance. Instead investors are motivated to buy credits for financial and sometimes altruistic reasons. For example, corporate investors buy credits to meet voluntary targets, prepare for potential regulatory compliance, improve their public image or meet corporate social responsibility guidelines. Individuals or non-profits also may buy credits to offset their own emissions, such as travel or energy consumption, or to support projects that meet their philanthropic goals (Point Carbon 2007; Taiyab 2005).²⁶

Because there is no legal mandate for emissions reductions in the U.S., the voluntary market is highly fragmented and lacks credibility. All the carbon credits on the voluntary markets come from emissions reductions projects (with the exception of the Chicago Climate Exchange, for which companies agree to voluntarily reduce their emissions to a specified target). Carbon credit sales are negotiated on a case-by-case basis and final prices are often not released. Moreover, there is no uniform system of certification or verification, nor are credits registered to a single body. This lack of transparency and uniformity calls into question the credibility of the voluntary market in reducing emissions. Buyers face the risk that their credits will not be delivered or that the same credits will be sold to multiple buyers (Bayon et al. 2007). For this reason, the voluntary market has gained a reputation as a forum for “snake oil salesmen.”

A number of standards have emerged to help increase the legitimacy of

²⁶ More recently, voluntary emission credits have been used for trades to comply with regional climate change plans, such as the 10-state Regional Greenhouse Gas Initiative.

the carbon market. The rigidity of these standards varies considerably, however. For example, the most stringent, Gold standard and VER+, are based on requirements modeled after the CDM. They require additionality tests based on investments, regulation, and baseline scenarios. More flexible standards, such as the Voluntary Carbon Standard (VCS), either do not require additionality tests or allow project developers to choose between different types of proof (Bayon et al. 2007; Point Carbon 2007). Proponents of these more lenient standards argue that there is no technically correct method of calculating additionality and that the flexibility of the market helps create financial incentives to reduce greenhouse gas emissions (Bayon et al. 2007).

More important, this flexibility may actually lead to projects that foster other social and environmental goals. The decentralized nature of the market avoids the kinds of bottlenecks created by the need for centralized approval under the CDM process. The transaction costs for project development are lower than under the CDM. This lower transaction costs and the flexible standards for calculating additionality and monitoring projects reduce the pressure on project developers to maximize carbon sequestration at the expense of other development goals (Bayon et al. 2007). The types of buyers also may lead to financing for projects with additional sustainable development benefits. Not bound by mandatory reductions, private firms often look for credits with a story that features social and environmental benefits to boost their public image. The

ability of non-profits and socially and ecologically conscious individuals to participate in the market also may increase the marketability of these projects (Bayon et al. 2007; Wishnie 2008). Finally, the lack of emphasis on the technicalities of calculating carbon offsets allows for projects, such as avoided deforestation and sustainable management, which are prohibited under the CDM.

These attributes of the voluntary market provide an opportunity for Costa Rica to finance its conservation initiatives through the voluntary market. In the past three years, three groups have contacted FONAFIFO to see if they could market Costa Rican projects on the voluntary market. FONAFIFO had contracted the Italian firm GEV Modena to look for investors on the European voluntary market (Herrera Ugalde 2008). Equator Environmental is looking to market the first AIJ project, Carfix, 53,000 hectares of conserved lands in the Central Volcanic Region on the U.S. voluntary market. In 2006 the American-based Pax Natura Foundation volunteered to sell tropical avoided deforestation projects on the voluntary market (Wishnie 2008; Tolpinrud 2008). In addition, Daniel Janzen, the conservation biologist who proposed Biodiversifix and wrote the GRUAS report, has been approached by a number of brokers to market the national park, the Guanacaste Conservation Area, which he maintains and once submitted to AIJ. Janzen is now negotiating with Costa Rican officials about reviving the Protected Areas Project through the international voluntary market

(Janzen 2008).

Equator Environmental, Pax Natura, and GEV Modena all act as brokers for Costa Rican projects. As a governmental entity, FONAFIFO is not authorized to negotiate deals with individual buyers. OCIC has lost most of its authority due to staff cuts and push for a more technical role in the climate negotiations and CDM. These intermediaries thus are essential in helping FONAFIFO package and market their projects to potential buyers. Equator and Pax Natura are currently looking to find buyers and to certify these projects under the Voluntary Carbon Standard (VCS) in order to enhance their credibility on the market. In addition, Equator hopes to find markets for the emissions already accrued by Carfix. As a for-profit entity, however, Equator will receive half of the sale profits, while the brokerage firm started by Pax Natura will only use funds to cover their administrative costs.. (Wishnie 2008; Tolpinrud 2008).

The Pax Natura Foundation provides an interesting case of the types of altruistic entities involved in the voluntary market. Since the 1980s, the foundation has been involved in efforts to conserve Costa Rican tropical forests. It has supported environmental education programs and purchased private land for park consolidation (Fundacion Pax Natura Abrira Escuela Ambiental En Costa Rica 2002; Tolpinrud 2008). The founders of Pax Natura, William Connelly and Randall Tolpinrud, were impressed with the success of the PSA program in the region where they had originally bought lands. Between 1999 and 2005, a total

7,193 hectares were enrolled in the incentive program. In order to avoid the deforestation of approximately 6,160 hectares in 10 years, Connelly and Tolpinrud proposed creating a separate brokerage arm of the foundation to sell credits and raise funds to continue and expand this support throughout the region. The total expected emissions reductions are close to 2 million metric tons of CO₂ per year and the total project cost is estimated at around \$9.7 dollars over the period of 10 years (Tolpinrud 2008; FUNDECOR et al. 2006).

The Pax Natura's involvement in offset projects highlights the opening in the voluntary market for entities whose primary interest is forest protection. Despite Pax Natura's status as a non-profit, all three brokers hope to help avoid tropical forest deforestation and believe that carbon markets are the best solution. In fact, in interviews, representatives of both Equator and Pax Natura emphasized their motivation to help Costa Rica share the costs of their conservation efforts with the international community (Herrera Ugalde 2008; Wishnie 2008; Tolpinrud 2008).

Costa Rica has many advantages in using the international voluntary market. Unlike with the CDM, Costa Rica's long running private incentive program is one of its major assets on the voluntary market. According to Mark Wishnie, project planner for Equator Environmental, Costa Rica was an ideal location to invest in for the voluntary carbon market because of its political stability and long-standing private incentive program. "The whole structure of the

infrastructure allows for execution of forestry carbon projects and their placement on the public registry. They have a national system of land use and verification... All these resources don't exist in other places" (Wishnie 2008). Working within the existing framework of the private incentive program makes it easier for managers to focus on project marketing without the need to establish infrastructure for verification and monitoring. Moreover, the long-standing incentive program and Costa Rica's reputation as a peaceful democracy adds legitimacy to Costa Rican projects. According to Janzen, "all of the sudden, the world is interested in Costa Rican carbon projects. I don't know what the market really looks like or what it will cost, how long it will last. Should I sell it one at a time, retail or wholesale or the whole farm? I'm like a farmer who grows tomatoes and all of the sudden market is crazy about tomatoes" (Janzen 2008).

On the other hand, the long-term demand for voluntary credits and the marketability of Costa Rican projects are still unknown. As with the CDM, most buyers are interested in the cheap offsets. In 2007 the amount of carbon sold on voluntary market in the U.S. alone tripled. Twenty percent of the projects transacted were land-use and forestry projects, but they only make up a tiny portion of the volume of CO₂ on the market. The largest quantity is made up of the same cheap methane reduction projects, as in the CDM market (Point Carbon 2007).

In addition to this appetite for cheap offsets, the prices of U.S. voluntary

offsets are also lower and more volatile than those on the EU's regulatory market due to the absence of mandatory caps to stabilize supply and demand.

Projects typically go for between \$2 and \$15 per tons of CO₂, compared to certifiable emissions reduction (CERs) prices, which ranged from \$7 to \$14 per ton of CO₂ in 2007. Forestry projects tend to be on the lower end (Bayon et al. 2007; Point Carbon 2007, 2008). According to Tolpinrud, FONAFIFO is looking to finance the Pax Natura project at a minimum of \$7 per ton of CO₂ (Tolpinrud 2008). Moreover, Janzen is looking to raise \$500 million for the Protected Area Project (Janzen 2008). Given the current prices, it is highly unlikely that Costa Rica will be able to achieve this level of financing on the U.S. voluntary market.

Although a few NGOs are trying to develop a niche market for sustainability-rich, and thus more costly, credits, a survey by the investment group EcoSecurities indicates that only 40 percent of companies investing in the voluntary market would be willing to pay more for such a project (Zwick 2007). Given the unwillingness of most buyers to pay more for niche credits, the higher land values and small size of the country means that countries like Bolivia have the potential to outbid Costa Rica on the market.²⁷ Moreover, companies interested in enhancing their public image can simply purchase the bulk of their credits cheaply with only a small portion dedicated to public relations friendly credits. For example, the Italian company Lifegate, Costa Rica's first investor on

²⁷ Bolivia is rumored to have outbid Costa Rica for a number of AIJ project financing and on the voluntary market.

the voluntary market, broadcasts its contribution to the program, despite only having purchased credits equivalent to 350 hectares of land (Lifegate n.d. ; Rojas et al. 2007).

In addition to the current low price of voluntary offsets and questionable demand for more expensive niche credits, the high volume and questionable nature of projects have led to talks about regulating the voluntary market. Depending on the definitions of additionality, these efforts may benefit or penalize Costa Rica. On the unregulated market, Costa Rica's reputation for sound environmental management and its stable democratic governance, made it a favorite for many socially responsible investors (Salinas 2008). If a higher regulatory standard adopts the strict view of additionality of the CDM, Costa Rica may be penalized. Currently, both Pax Natura and Equator Environmental are using methodologies developed by Franz Tattenbach to calculate baselines and additionality, which have a looser definition of additionality than the CDM (Wishnie 2008; FUNDECOR et al. 2006).

Despite its flexibility and the intentions of altruistic brokers on the international voluntary market, it is too early to forecast whether this unregulated market will finance Costa Rican projects. While the Pax Natura Foundation has donated one million dollars to FONAFIFO as payment for the first year of emissions reductions, to date only one sale for 350 hectares of conservation has been transacted (Herrera Ugalde 2008; Tolpinrud 2008). Although its flexibility

and low transaction costs makes it easier to place forestry offset projects of the international voluntary market, the experience with AIJ and the current low prices have made Costa Rica wary of placing too many projects on the international voluntary market too soon. Currently, Fundecor is the main organization looking to guarantee future environmental service payments to farmers in the Central Volcanic Mountainous Range through the voluntary markets. It has exclusive contracts to market a total of 67,000 hectares of land to Environmental Equator and Pax Natura. FONAFIFO expects to add projects earmarked for the CDM on both the voluntary and Kyoto compliant markets, but it is uncertain how much it will use this market (Herrera Ugalde 2008). “VERs pay nothing, \$2 on the exchange. This is not going to pay for anything we need,” claims Jorge Monge Zeledon, an environmental consultant to the Costa Rican government, commenting on the Costa Rica’s ambitions for the international market. “Instead we have chosen to develop a standard nationally and a marketing instrument, C-neutral” (Monge Zeledon 2008).

Stimulating a Market from Within

By stimulating a market for carbon offsets within its borders, Costa Rica hopes to get the price it needs to pay for its conservation efforts. This effort highlights Costa Rica’s disappointing experience with the international climate policies and carbon markets. Although the country has had some initial success generating

revenue through the current domestic voluntary market, mandating carbon neutrality may be difficult because of the high cost of mitigation and opposition from agricultural interests.

In February 2007 President Oscar Arias Sanchez announced Costa Rica's intention to be the first carbon-neutral developing country by 2021. Costa Ricans emit few greenhouse gases—2.2 metric tons of CO₂ per capita annually, compared to 24 and 9.5 metric tons emitted by U.S. and E.U. citizens respectively (Instituto meteorologico nacional 2005; Costa Rica Protege Al Planeta 2007). Cumulatively, this represents less than .01 percent of the world's annual emissions. Nonetheless, Costa Rica believes that by going carbon neutral, it will be able to increase its competitive advantage and stimulate new ways to finance conservation activities.

Costa Rica's plan for carbon neutrality focuses on reducing emissions at their source. To be announced at the end of March 2008, the National Strategy for Climate Change (ENCC) identifies the key sources of emissions in Costa Rica and proposes a host of policy changes to address them. Transportation, the leading cause of emission in Costa Rica, contributes to 29 percent of the country's greenhouse gases. Livestock contributes 22 percent, agriculture 21 percent, and 12 and 11 percent are linked to emissions from industries and garbage, respectively (Instituto Meteorologico Nacional 2005). The plan proposes changes to the energy sector to allow companies and individuals to

generate electricity on their own, creates incentives for carbon neutral industries, and makes changes in land use and agriculture. At this stage, however, ENCC is focusing on voluntary programs to help companies and individuals reduce and mitigate their carbon footprint.

To this end, the Ministry of Environment has created a trademark for carbon neutral companies. From the outset demand for the C-Neutral mark was very high, with more companies applying than ENCC's small staff and resources could handle (Monge Zeledon 2008; Musmanni 2008). As a pilot phase, ENCC has enrolled 11 groups who have agreed to let the government calculate their carbon footprint and identify strategies for emissions reductions and compensation. These include large multinationals like Chiquita Banana, Dole, Coca Cola, and local companies, including two of the largest construction companies (Estrategia Nacion de Cambio Climatico 2007). In an interview with NPR, Costa Rica's environmental minister Roberto Dobles describes his vision for a carbon neutral banana. "What is a carbon neutral banana? It is a banana that reduces emissions at the agricultural level, at the local transportation level from the farms to the airport, and will also reduce the emissions from the boats that take the bananas to the free market" (Burnett 2008). Chiquita and Dole are considering strategies to decrease their emissions, by growing their own biodiesel and improving plantation management (Musmanni 2008). While these actions help reduce emissions directly, to neutralize their carbon footprint

companies will also have to commit funds, between \$5 to \$10 per ton of CO₂, to compensate farmers for conservation on private lands through the PSA program (Fonseca 2007; Vargas 2008).

The move towards carbon neutrality has created a new domestic carbon market for Costa Rica's conservation program. In addition to the pilot program, FONAFIO in conjunction with the Costa Rican Tourism Institute have developed a way for travelers to reduce their airline emissions by investing in the landowner program. Companies and individuals can calculate their emissions online and pay to compensate them for \$5 per metric ton of CO₂. In the first two months of the program, seven industries, hotels, local airlines, and 316 individuals signed up to mitigate their airline emissions through the private incentive program (Aguero 2007). FONAFIFO has raised a total of \$5,715 and mitigated 1,143 tons of CO₂. For example, the airline Nature Air agreed to incorporate the fee as a tax on all their airplane tickets. Jorge Mario Rodriguez, director of FONAFIFO, expects that the voluntary plan will help generate up to \$40 million between 2007 and 2011 for FONAFIFO (Vargas 2007).

Through these new efforts, Costa Rica also hopes to boost the image of Costa Rican offsets abroad. The government is developing a new standard for calculating and verifying emissions credits. Costa Rica hopes that the new trademark also will increase the value of carbon offsets on the international market. "If Costa Rica gets a reputation as a good, reliable market, than buyers

will be willing to pay for more expensive CERs or VERs. They will be able to take on the brand C-neutral” (Monge Zeledon 2008). Skeptics claim that this new effort is just smoke and mirrors, however. Bioeco, a carbon mitigation company, claims that the government’s monopoly on offsets fails to create a real competitive market and will just fatten the pockets of politicians (Fonseca Q 2008). Friends of the Earth, an international environmental NGO, points to Costa Rica’s hypocrisy in calling for carbon neutrality on the one hand while negotiating with China to develop a new refinery on the other (Burnett 2008). Moreover, critics of the PSA program claim that it is unclear how FONAFIFO will use the funds it raises. Given that the funds are not project based, as they are in the international markets, FONAFIFO has more discretion over resources.

Individuals pay five dollars for each ton of CO₂ they emit, but conservation payments may not actually be covering the emissions they are supposed to.

Furthermore, although Costa Rican companies are currently lining up to get the C-neutral brand, carbon neutrality may be difficult for the government to achieve. Paulo Manso, the director of the National Meteorological Institute admits that Costa Rica does not yet know if it can achieve neutrality or just meet a target (Manso 2008). In 2005 Costa Rican plant life absorbed about 2.5 million tons of CO₂; but Costa Ricans produced five times that about 12.5 million tons of CO₂ (Burnett 2008). Increasing these emission reductions through Costa Rican forests may be untenable without strong regulations on land use. But Costa

Rica faces many political and financial challenges in making carbon neutrality mandatory. Agricultural and livestock interests have strongly opposed the idea of carbon neutrality. “Right now there is a tension as plans are developed on one side for increasing livestock and agriculture, and on the other side the strategy for C-neutrality. How can you have both? Who knows who will win the battle” (Musmanni 2008).

Without mandatory cap on emissions, the Costa Rican voluntary market may suffer the same failures of the international voluntary carbon market: a low price and uncertain demand. Nonetheless, given the sluggish movement of the CDM, these domestic efforts to capitalize on the carbon craze may help Costa Rica come a little closer to achieving its sustainable development goals.

EVALUATING COSTA RICA’S FOREST POLICY

The Costa Rican case highlights how countries can think creatively about reframing climate change in order to meet their own sustainable development goals. In the early days of the climate regime, Costa Rican actors played an integral role domestically and internationally. They reshaped the country’s forestry policy to take advantage of the climate funds while reinforcing other social and environmental goals. They also helped create a permanent mechanism that would allow developing countries to implement projects that met

their own domestic priorities. Despite the ingenuity of these domestic political actors, to date Costa Rica has failed to finance its sustainable forestry reforms through the international climate policies and carbon markets.

In fact, although Costa Rica hoped to promote itself as a model for using international markets to finance sustainable development, it has demonstrated instead that international grants and domestic efforts to internalize the costs of environmental services may be more effective than the international carbon market. This new, mandatory approach points to both Costa Rica's pragmatism in relation to forestry financing and its disappointing experience with the international carbon market. This financing shift however has come at the expense of its original goal to conserve 90 percent of the country's biodiversity through national park consolidation.

Between 1994, the inception of the experimental period of Activities Implemented Jointly (AIJ), and 2005 Costa Rica generated a mere \$5.2 million dollars from the official international carbon market.²⁸ Approximately \$3 million of these carbon dollars were generated during the AIJ phase from two projects. The remaining came from the World Bank's Biocarbon fund, created to help facilitate CDM forestry projects.²⁹ Compare this figure to the estimated \$10 million dollars generated annually by the gas tax since 2001 (Pagiola 2006).

Even though Costa Rica hopes to stimulate a domestic carbon market

²⁸ This does not include voluntary funds.

²⁹ Calculated by author from UNFCCC website for AIJ and CDM projects and FONAFIFO's website.

within its own borders, voluntary markets for environmental services provide only a slice of the revenue needed to support the private incentive program. From 2001 to 2005, 11 water service providers—including a bottling company, four hydroelectric companies, and municipal water providers—have financed conservation payments, equivalent to an average of \$500,000 annually. To date, Conservation International is the only buyer of conservation certificates (CSAs) for biodiversity, having donated \$500,000 to pay half of the cost of agroforestry contracts in three key conservation areas. The National Institute of Biodiversity has signed a number of bioprospecting contracts with pharmaceutical and research firms like Merck, but there has been little market interest in financing biodiversity conservation on private lands. Despite the plethora of ecotourist companies in Costa Rica, none have invested in its scenic beauty contracts.

In fact, Costa Rica has been shifting away from a voluntary market-based approach towards one based on compulsory domestic fees and international grants. Since 2001 the PSA has primarily been financed through approximately \$70 million in gas tax revenues, a \$32.6 million loan from the World Bank, a \$8 million grant from GEF, and a \$2.3 million development grant from the German organization KfW. Beginning in 2007 PSA has been financed through an additional \$8 million from GEF and a \$10 million loan from the World Bank Mainstreaming Market Based Incentives for Environmental Management (MMBIEM) program. In 2006 the Legislative Assembly passed a law to increase

water tariffs to the Costa Rican consumers, a move that is expected to generate \$19 million annually. One-fourth (\$5 million) of these payments will go to FONAFIFO to finance environmental service agreements in the watershed where the funds are generated, and one-fourth will go to maintaining protected areas (Pagiola 2006; Herrera Ugalde, 2008). In addition, if fully implemented, Costa Rica's carbon neutral strategy will generate additional dollars, as companies are compelled to mitigate their carbon footprint.

This new, mandatory approach points to both Costa Rica's pragmatism in relation to forestry financing and its disappointing experience with the international carbon market. While the country initially expected to finance both its social and ecological goals of its forestry reform through the international climate mechanism, political decisions at the international level, the CDM's hostile rules and high cost of implementation, and the lack of binding commitments of the voluntary market have inhibited these developments. These barriers have forced Costa Rica to find new and stable sources of financing, which may have in fact enhance its indigenous ability to implement projects that meet its own social and ecological goals. In fact, although Costa Rica has failed to use international climate policies and markets to support its sustainable forest reforms, it has been successful in finding domestic forms of financing for its private landowner program.

By diversifying its sources of financing, FONAFIFO has expanded the

program to a total of 377,000 hectares and 1.2 million trees in the last 10 years (FONAFIFO 2007). Yet the evidence pointing to the social and ecological benefits of the PSA program is mixed. A World Bank study indicates that FONAFIFO has done a good job increasing small landowner and minority participation. In 2005, 60 percent of contracts, representing 40 percent of the area conserved, were collective contracts for small landowners (Pagiola 2006). During 2004, female participation accounted for 11 percent of the hectares enrolled, a 1,114 percent increase from 1997. Participation of indigenous communities had increased by 536 percent (Elizondo 2004 cited in FONAFIFO 2005). A study in the Osa Peninsula, where 50 percent of the farmers live in extreme poverty, showed that the payments played a significant role in maintaining the livelihoods of poor farmers (Munoz 2004; FONAFIFO 2005). Yet no comprehensive study of the incentive program has attempted to look how payments are distributed or its impact on poverty.

Assessing ecological benefits of Costa Rica's environmental payment program has been more difficult. Although PSA program is supposed to benefit biodiversity, watershed protection, scenic value and sequestration, FONAFIFO assumes that all these benefits are generated just based on the hectares enrolled in the program, not on any systematic verification. According to a World Bank study, at the end of 2005, 30 percent of active contracts were in the biodiversity priority areas identified by the GRUAS report. If one includes other

priority areas identified by international donors such as transboundary biological corridors, this figure increases to 59 percent. Only 3 percent were contracted inside protected areas, however—the areas which Costa Rica had intended to purchase (Pagiola 2006). Furthermore, only two areas are currently monitored for biodiversity, and both are funded through GEF's Ecomarket project, which explicitly identified areas to test the biodiversity benefits of private lands near biological corridors and on former pasture lands (Pagiola 2006). Similarly, none of the hydrological areas under water conservation contracts have been tested for improvement in water quality. While they are the most difficult to finance, CDM projects are the only ones that require verification beyond forest-cover evaluations.

To address the environmental and social shortcomings of the program, the Arias administration is making efforts to improve the program's focus and deliverables. FONAFIFO is currently in the process of identifying areas where biodiversity, watershed, and carbon sequestration can be maximized simultaneously. With the help of a second GEF EcoMarkets grant, Costa Rica is developing a biodiversity fund to target and monitor biodiversity priority areas (Herrera Ugalde 2008). Water service fees will help expand the program to different regions and may require monitoring. The environmental ministry (MINA) is also considering introducing a poverty relief payment as a complement to the ecosystem services payment, with the help of funds from the

World Bank. In addition, the administration hopes that the government's new guidelines for carbon neutrality will increase the accuracy of carbon sequestration calculations (Monge Zeledon 2008).

Although these efforts should help Costa Rica improve the efficacy of the PSA program in meeting its sustainable development objectives, many conservationists still believe that incentives to landowners are a poor solution for protecting forests in the long term when compared to national park consolidation. The decision to exclude avoided deforestation in the CDM and the conditions of the World Bank loan meant that there have been no sources of financing for this effort. Moreover, according to Janzen, after the end of the Figueres administration the government lost its focus on preserving four percent of the world's biodiversity and began funneling all its resources towards the more politically popular environmental service payment program.

[The original goal was] to consolidate individually conserved pieces and to get them back into big lumps. The only thing that will eventually survive are the big lumps. But when the [Figueres] government ended, the whole thing died...In theory the [PSA program] was supposed to pay for a piece of land until you could buy it... It was not until the end of last administration that I was able to understand that this was not going on (Janzen 2008).

According to Janzen, Costa Rica's inability to generate funds through international carbon market coupled with new financing for the PSA program influenced the government to move away from the original goals of protecting 90 percent of Costa Rica's biodiversity through park consolidation to a more unfocused conservation program.

Reorienting Costa Rica's program towards this original goal should be a domestic and international priority. The Costa Rican government needs to renew its effort to consolidate the country's national park system, by prioritizing private lands for purchase, strengthening local park administration and building synergies between the private land program and national park system. As a first step, FONAFIFO should prioritize private conservation and reforestation around national park boundaries or in areas that yet have been consolidated. MINAE however should develop a long-term plan for buying up the parcels identified in the GRUAS report and maintaining them in the long term. One option, proposed by Janzen, would be to decentralize national park management and financing to give local authorities more control over management decisions.³⁰ Verifying land use changes through satellite imagery and monitoring areas vulnerable to logging on the ground should be invested in heavily.

These efforts require a significant financial investment. Currently, most of the new mandatory taxes are earmarked for the PSA program. Distributing funds to both the national park system and private land conservation could help

³⁰ Under the current national park system, local park authorities must first get central government approval before making management decisions. This process is slow and bureaucratic. Conflicts are common between the central government and local forest managers due to differences in priorities and management style. Janzen already manages the Area de Conservacion Guanacaste independently through a non-profit. Decentralizing the entire national park system would allow local authorities more discretion over how funds are used. Annual or biannual audits by the central government would ensure that funds were not used inappropriately.

jumpstart the effort to protect 90 percent of Costa Rica's biodiversity in perpetuity. This domestic financing however will likely be insufficient to support both programs.

For Costa Rica to finance its forest reforms adequately, the global benefit from the country's forest must be paid. International climate policies remain one of the few chances to pay this debt and help Costa Rica institutionalize the original reforms it hoped to undertake.

CONCLUSION: THE ROAD TO BALI AND BEYOND

Costa Rica's efforts to use international climate policies and markets illustrate the failure of the existing climate regime to provide meaningful incentives to developing countries to stem global deforestation and increase reforestation.

Political decisions at the international level that favored the interests of developed countries over those of forestry advocates in developing countries led to this failure, first by excluding incentives for avoided deforestation and second by creating an unnecessarily complicated mechanism for reforestation incentives for developing countries. This outcome is quite common in international treaty making because of what is known as the "two-level game" of international negotiations (Putnam 1988). At a domestic level, domestic interest groups compete to pressure the government to adopt policies favorable to their interests. At the international level, negotiators from each country "seek to maximize their own ability to satisfy domestic pressures, while minimizing the adverse

consequences of foreign development” (Putnam 1988). This domestic-international balancing act often detracts from the overarching environmental goals of the treaty. In fact, negotiators often look for stability and consensus at the expense of environmental effectiveness and equity (Ross 1996).

The “stability-effectiveness trade-off” is evident in the international climate regime’s negotiations over forests (Ross 1996). At the beginning, two strong coalitions competed over the inclusion of avoided deforestation in the CDM. But the U.S.’s decision to drop out of the negotiations weakened the coalition in favor of incentives for avoided deforestation. Developed countries that had once supported these incentives agreed to exclude them in order to maximize their own domestic gains. This international decision enabled the ratification of the Kyoto Protocol, but it significantly limited Costa Rica’s ability to implement its domestic forestry reforms; it also compromised the effectiveness of the international regime in addressing the second largest cause of deforestation. In fact, the weak regime discourages developing countries from reducing their deforestation and creates a disincentive for countries to link climate change to sustainable development.

The consequences of the international climate regime’s weaknesses are clear: in the developing world, it is still more lucrative to cut down trees than to protect them. One ton of carbon from avoided tropical deforestation in Costa Rica has the same benefit as one ton of carbon from building a wind turbine in Sweden. Yet a ton of carbon emissions sequestered or avoided in Sweden is worth about \$15 on the E.U. carbon exchange, while the equivalent in a

developing country has no value. More than 15 years since the inception of the UNFCCC, the world continues to lose almost 13 million hectares of forests—an area more than twice the size of Costa Rica—every year to logging, agriculture, and other activities (VOA English Service 2007). As a result, deforestation still accounts for 20 to 25 percent of the global emissions.

Thankfully, a global consensus is emerging around the importance of addressing deforestation in the international climate change regime. In 2005 Costa Rica, in collaboration with Papua New Guinea, formed a new, multi-regional Coalition for Rainforest Nations to bring back avoided deforestation in the second commitment phase and shape the rules for a new mechanism. A year later, the group submitted a consensus document to the Subsidiary Body for Scientific and Technological Advice offering to reduce emissions voluntarily by conserving forests in exchange for access to international markets for emissions trading. The first time that developing countries had agreed to reduce their emissions voluntarily, this submission was a huge step in creating consensus around a new Protocol (Coalition for Rainforest Nations 2006).

In November 2006 calls for the inclusion of avoided deforestation gained prominence through the release of the Stern Report. Created by the British economist Nicholas Stern, the report outlines the strategies to address climate change, which Stern calls the “greatest global market failure we have ever seen” (Stern 2006). Stern argues for making avoided deforestation one of four key elements of a global mitigation strategy, calling it a “highly cost effective way of reducing greenhouse gas emissions...fairly quickly” (Richards and Jenkins

2007). The Stern report, as well as pressure from developing countries, prompted climate negotiators to renew discussions about avoided deforestation at the 2007 Bali negotiations, where they gathered to set the agenda for the second commitment phase.

As it turned out, the inclusion of avoided deforestation was one of the few issues that negotiators could agree on at Bali. (The U.S.'s refusal to agree on numerical targets for emissions reductions stymied negotiations about the next commitment period.) According to Elliot Diringer, director of international strategies at the Pew Center on Global Climate Change, forest protection "was the one concrete area where you had a contingent of developing countries coming forward and saying, 'We want to do something. Let's talk about what we can do'" (Greising 2007). The World Bank's announcement of its new \$300 million Forest Carbon Partnership program to help countries develop avoided deforestation projects bolstered support for the inclusion of avoided deforestation on the Bali Road Map (VOA English Service 2007). Furthermore, since the original CDM negotiations in 2001, Brazil has lifted its opposition to including incentives for conservation.

This strengthening consensus is a major step, but the appropriate design of a new mechanism remains uncertain. Most scientists advocate for a fund that would pay developing countries for lowering their deforestation rates and increasing forest cover on the national level. Countries would need to develop national inventories of their forest stocks, which could be monitored using satellite technology. Such a system would correct many of the problems

currently attributed to the CDM: it would lower the transaction costs of project approval, calculating carbon sequestration, and tracking permanence, and would address scientific concerns about leakage of project-based activities. It would also increase the scale of reforms (Peskett and Harkin 2007).³¹ Funding has been notoriously unreliable in global environmental treaties, however, and conflicts over the management and distribution of payments are often intense (Fairman 1996). Moreover, many economists doubt countries will raise the amount of capital needed to reduce deforestation. According to the Stern report, between \$5 and \$15 billion annually is needed to reduce deforestation by 50 percent (Stern 2006). Instead economists propose a market-based approach based on national inventories. As with the CDM, countries would compete on international market for financing. Companies could either invest in projected emissions reductions from an overall decrease in deforestation and increase in forest cover, or pay for them after they occur.

Many developing countries, including those in the Coalition for Rainforest Nations, favor a national approach that guarantees funding for large-scale changes without complicated project-by-project calculations, temporary crediting systems, and verification. Such an approach would allow developing countries to develop programs at whatever level—national, sectoral or local—they deem best suited to meet their national targets (Coalition for Rainforest Nations 2007). Brazil opposes a national mechanism, however. It wants a supplementary

³¹ As noted earlier, many scientists were concerned that forest-offset projects did not account for changes in land use and deforestation in other areas of a country (leakage). In contrast, tracking deforestation and reforestation using country-wide satellite imagery allows monitoring of leakage in a more cost-effective and scientifically rigorous way.

mechanism that is project based, like the CDM, which is not contingent on the country's deforestation rates.³²

The history of events since 1992 illustrates the need to develop a proposal that can unite different interests through flexible policies that guarantee funding for developing countries with different levels of deforestation. Interest-based conflicts among countries have for too long stymied action to address deforestation. Complicated rules used to reduce scientific uncertainty have impeded efforts to slow deforestation. Although a national approach meets the needs of both countries that want to lower their deforestation and scientists who want to ensure carbon accounts are accurate, a parallel project-based approach would allow countries that are not ready to support and participate in such a regime.

For a market approach to work, however, developed nations need to adopt more stringent emissions cuts in order to stimulate the market price necessary to influence developing countries to curb their deforestation rates.³³ According to the IPCC at least \$20 per ton of CO₂ is needed; others put the figure between \$40 to \$50 (Coalition for Rainforest Nations 2007). Although international decisions have had a negative impact on developing countries to date, a substantial investment on the international level could have a beneficial catalytic effect by empowering domestic advocates in developing countries and

³² Brazil argues that a decentralized approach would decrease the need for administration on the national level and create a more direct link between avoided deforestation and payments. Brazil's proposal reflects the country's concern that it will not be able to lower its deforestation rate quickly enough to take advantage of these financial incentives.

³³ Getting the U.S. to agree to substantial cuts is unlikely. This however should not deter other developed countries to accept deeper emissions targets. The U.S. will likely create its own parallel system. For example, the U.S. Congress is considering a bill that could generate \$28 billion for avoided deforestation from 2012 to 2020. The Lieberman-Warner proposal hopes to get these funds by limiting emissions credits in the U.S. and distributing 2.5 percent of them to developing countries for avoided deforestation. This scheme would improve the U.S.'s image by making it the "early mover in developing this market" (Malcomson 2008).

building pro-reform government alliances (Keohane 1996; Fairman and Ross 1996).³⁴ Deeper cuts should be complemented by other intermediate incentives, such as a global fund and additional commitments for overseas development assistance, to build capacity in developing countries, help them create national forest inventories, and subsidize activities until a market is created.³⁵

Rewarding early actor should also be a hallmark of the next international climate policy.³⁶ Providing incentives only to countries that were major polluters and deforesters sends a perverse message to countries about the importance of environmental protection and sets a bad precedent for future international environmental treaties. Although getting these big polluters on board is essential to address emissions from deforestation, proving early reformers with the ability to participate in the regime, through incentives for long-term conservation and maintenance and flexible historical baselines, is essential to the equity and efficiency of a future international climate policy.

³⁴ For example, in the Philippines, "green" conditions attached to structural adjustment loans helped strengthen domestic conservation advocates in the Aquino government.

³⁵ For example the Coalition for Rainforests Nations proposed a number of possible strategies to generate the estimated \$15 billion annually to curb deforestation in developing countries. These include: creating a fund through a \$.3 per barrel taxes on oil, voluntary user fees of \$22/ton on air transport, or \$.3 fees on emissions allowances, increasing overseas development assistance by 12.5%, developing a voluntary market solely for forestry offsets, and increasing emissions commitments for developed countries by 9 percent.

³⁶ At Bali, Costa Rica, supported by India, fought hard for a reference to financial incentives for conservation and management activities in the final agenda (Earth Negotiations Bulletin 2007). The Coalition for Rainforest Nations has proposed a basket of incentives and mitigation options which include a reference to early action and flexible baselines but the reference to early action remains bracketed in the final text (Earth Negotiations Bulletin 2007; Coalition for Rainforest Nations 2007). In fact, most forest experts expect that the new avoided deforestation mechanism will base deforestation credits against historical baseline rates; the choice of dates will likely create winners and losers (Richards and Jenkins 2007). Winners are likely to be countries with high deforestation rates, like Brazil and Indonesia, where 80 percent of carbon dioxide emissions stem from deforestation. Again, Costa Rica is likely to lose out on much of the financial benefits given its positive net gain in forest cover in the last ten years.

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APPENDIX A: LIST OF INTERVIEWEES

Organization	Person	Title	Project	Interview date
FUNDECOR	Franz Tattenbach	National Coordinator	Conservation organization that was first to put a AIJ project; also former head of OCIC	January 25, 2008
OCIC	Paulo Manso	Director	Organization in charge of representing Costa Rica at international conferences and selling offsets	January 18, 2008
CATIE	Lucio Pedroni	Group leader of Proyecto Forma	Research group in charge of CDM for forests	January 11, 2008
CATIE	Juan Robalino	Researcher	Scientists studying deforestation in Costa Rica	January 10, 2008
CATIE	Zenia Salinas	Coordinator of Proyecto Forma	Group to fortify CDM in forestry and bio-energy in latin america	January 11, 2008
ENCC	Irina Katchan	Director	Group in charge of climate change plan	January 9, 2008
ENCC y CNPL	Dr Sergio Musmanni Sobrador	Consultant	Group in charge of climate change plan	January 9, 2008
ENCC	Jorge Monges Zeledon	Consultant	Group in charge of climate change plan	January 9, 2008
FONAFIFO	Maria Elena Herrera Ugalde	Director of Resource Management	Government forest incentive group	January 17, 2008
FONAFIFO	Alfonso Garcia	Assistant to Resource Management	Government forest incentive group	January 17, 2008
Equator Environment	Mark Wishnie	Project Manager	Environmental broker on international voluntary market	February 22, 2008
	Christiana Figueres		Negotiator for Costa Rica at UNFCCC	February 21, 2008
The Nature Conservancy	Daniel Janzen	Scientist and ParkManager	Conservationist involved in GRUAS and Biodiversifix	February 18, 2008
Pax Natura	Randall Tolpinrud	Director	New group trying to market Costa Rican projects on AIJ market	February 28, 2008
Point Carbon	Elisabeth Lokshall	Project Manager for CDM	Research group that looks at carbon market.	March 1, 2008

APPENDIX B: AIJ PROJECTS¹

Project name	Type	Forestry type	Financed (yes/no)	metric tons of Carbon (mtC)	Total hectares	Total Financing (\$)	International Financing (\$)	Conservation (ha)	Re-forestation (ha)	Natural Re-generation (ha)	Description
Ecoland Project	AIJ	Conservation	yes	1267124	2500	\$950,000	\$950,000	2500	0	0	The ECOLAND Projects aims to preserve tropical forest through the purchase of approximately 2,500 privately-owned hectares in the Piedras Blancas National Park (formerly named the Esquinas National Park) in southwestern Costa Rica. The purchased land would be transferred to the Costa Rican Park Service for permanent protection. The Ecoland project would protect 20% of the parkland.
Virilla/Norway	AIJ	Conservation and reforestation/regeneration	yes	1150139	4000	\$3,390,000	\$2,000,000	3000	500	500	In the Virilla river basin, the project includes four thousand hectare (ha) of reforestation and forest conservation/regeneration. One thousand ha were targeted for reforestation and 3,000 ha for conservation.

¹ All project information comes from the UNFCCC AIJ website at http://unfccc.int/kyoto_mechanisms/aij/activities_implemented_jointly/items/2087.php (UNFCCC n.d)

Protected Area Project (PAP)	AIJ	Conservation and regeneration	no	55817248	530000			530000		PAP project aimed to purchase of approximately 530,000 ha of privately owned hectares in national parks in Costa Ricas 8 biological zones.
Carfix	AIJ	Conservation and reforestation/ regeneration	no	21778313	108265			92053	16207	Project CARFIX aimed to stabilize the existing natural forest and create additional forest cover in the Central Volcanic Conservation Area (ACCVC), which constitutes a 290,187-hectare (ha) buffer zone surrounding the World Biosphere Reserve of Braulio Carrillo National Park.
Klinki	AIJ	Reforestation	no	7216656	6000				6000	The Klinki Forestry Project aimed to convert pastures and marginal farmland to commercial tree plantations by promoting the planting of 6,000 hectares of private farms with a mixture of selected fast-growing Klinki and other tree species. The trees will be harvested periodically for use in long-lived lumber products (such as utility poles) or left standing. The project will include small, medium, and large farms, educational pilot projects, and investor farms. Farmers will be given incentives for plantings in return for the rights to the sequestered carbon.

Biodiverfix		Regeneration		18481680								Project BIODIVERSIFIX combined two subprojects, WETFIX and DRYFIX. Carbon sequestration in WETFIX included restoring 13,500 ha of abandoned or marginal pasture interspersed throughout a 40,000-ha mosaic of middle-aged to primary wet forest. Some 6,100 ha of natural and semi-natural forest would be regenerated within the current boundaries of the conservation area of Guanacaste (ACG), and 7,400 ha of marginal pasture to be purchased and added to the ACG.
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APPENDIX C: CDM PROJECTS²

Project name	Type	Forestry type	Project Stage	metric tons of Carbon (mtC)	Total hectares	Total Financing (\$)	Anticipated International Financing (\$)	Reforestation (ha)	Natural Regeneration (ha)	Agro-forestry (trees)	Description
CoopeAgri (only project financed)	CDM	reforestation, agroforestry, natural regeneration	Project Design Document (PDD)	44,773 tons over 20 years	4,140	\$4,140,000	\$2,207,000	300	3600	180,000	The main goal of the project is the recovery of the forest cover in 3,900 ha, which are presently dedicated to pasturelands or croplands (due to reforestation and natural regeneration). These new areas would provide raw material for the forest industry, decreasing the illegal logging and damage of the remaining natural forest. 14 rural communities near the project area. Their main economic activities are based on agriculture and cattle-raising. These activities are going through difficult times due to fluctuations in the international prices.

² All project information come from project documents for FONAFIFO at the following webpage http://www.fonafifo.com/paginas_espanol/noticias/e_nt_noti001.htm

Los Santos	CDM	reforestation, agroforestry, natural regeneration	PDD but now aimed at voluntary market	50,000 tons of CO2/year during at least 20 years,	3600	2,940,000	2,750,000	300	3000	105,000	The goal of the project is to recover 3750 ha of forest cover which are presently dedicated to pasturelands or croplands. These new forests will provide raw material for the forest industry, decreasing the illegal logging and damage of the remaining natural forest. 258 rural towns are in the project area. Their main economic activities are based on agriculture and cattle farming.
Nicoya	CDM	reforestation, agroforestry, natural regeneration	PDD	2,259,000 tons	4800	4,985,464	4,575,200	1800	3000	240,000	The goal of this project is recovering 4800 ha which are presently dedicated to pasture. 211 rural communities area in the project area. Their main economic activities are based on agriculture and cattle-raising.
Dikes I	CDM	natural regeneration and agroforestry	PIN	1,976,267	3000	3,001,074	2,898,200		3000	90,000	Deforestation and human activities have substantially modified the vegetative cover of the indigenous lands in Costa Rica's Pacific Zone. Except for the areas at high elevation, pastures have replaced the forest cover over. Dense forest areas declined about 63% in 1972. By 1997, only about 44 % of the watersheds remain under dense forest cover, much of it restricted to high elevation areas of the indigenous territories. The indigenous people of the

												Cabagra, Ujarras and Salitre want to revert this deforestation. 14 rural communities live near the project area.
Dikes II	CDM	natural regeneration and agroforestry	PIN	2,959,818 tCO2 over 60 years	4500	4,504,707	\$4,210,100		4500	120,000		Only 12.3% of the land belonging to the Brunka people is still forested. 37 rural communities live near the project area. Their main economic activities are based on agriculture and cattle-raising
Coto Brus	CDM	reforestation, agroforestry, natural regeneration	PIN	2,259,276 tCO2 over 60 years	4800	4,895,464	4575200	1800	3000	240,000		The recovery of 4800 ha of land presently dedicated to pasture is the main goal of this project. 113 rural communities live in the project area. Their main economic activities are based on agriculture and cattle raising.

Zona Norte	CDM		PIN	594 876 over 20 years	4,500	n/a	n/a	4500	180000	The main goal is the restoration of 4500ha of forest cover currently dedicated to pasture. 527 rural communities live in the project area, who mainly depend on agriculture and pasture. The forests also compete with commercial agriculture such as pineapple, orange and sugar cane.
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APPENDIX D: International Voluntary Market

Project name	Type	Forestry type	Investor	metric tons of Carbon (mtC)	Total hectares	Total Anticipated Financing (\$)	Project Description
Lifegate/Italian project	Voluntary	conservation, reforestation, and agroforestry	Lifegate	unknown	350	unknown	Over the course of 5 years, Lifegate has purchased carbon credits for conservation, reforestation and agroforestry on 350ha of lands. One of the project locations includes an agroforestry on the the Bribri Indigenous reserve. (Herrera Ugalde, 2008)
Pax Natura	Voluntary	conservation	Pax Natura	1,935,074 over 10 years	24,438	\$10,642,907	In the cordillera volcanic central valley, this site connects three national parks of Braulio Carillo, Irazu and Turrialba and two Atlantic aquifers (Pax Natura 2008).
Carfix	Voluntary (and AIJ)	conservation and reforestation	Equator Environmental	unknown	43,000	\$5,000,000	In the cordillera volcanic central valley, this project will protect 43,000ha and pay 500 small farmers for conservation and reforestation (Equator Environmental, 2007)