Seeing REDD: Reducing Emissions and Conserving Biodiversity by Avoiding Deforestation[1]

Annah L. Peterson[2], Louise A. Gallagher[3]*, David Huberman[4] and Ivo Mulder[5]

ABSTRACT

Deforestation accounts for 20-25% of greenhouse gas emissions. It is also a major and immediate cause of global biodiversity loss. Protection of existing forests through Reduced Emissions from Deforestation and Degradation (REDD), therefore, has the potential to deliver both climate change mitigation and biodiversity conservation benefits. This paper explores how these complementary goals can be supported by international payments for ecosystem services (IPES) via the emerging global carbon market. REDD, through an IPES framework, offers an opportunity to 'bundle' payments for reduced emissions with payments for biodiversity conservation and possibly other ecosystem services. Bundling payments for reduced emissions and biodiversity conservation in this way allows for cost-sharing between the multiple beneficiaries of REDD projects. This paper outlines potential cost-sharing arrangements between carbon investors financing reduced emissions and beneficiaries of biodiversity conservation provided by REDD. Two possible mechanisms for bundling payments are discussed. One scheme combines finances from general biodiversity beneficiaries as a whole with carbon investments in REDD through a global fund; a second scheme matches payments from specific biodiversity beneficiaries with investments in REDD through a payment 'partnership' between both groups. The aim in both cases is to achieve two complementary environmental goals at an overall lower cost.

Keywords: Avoided Deforestation, Reduced Emissions for Deforestation and Forest Degradation (REDD), International Payments for Ecosystem Services (IPES), Biodiversity Conservation

I. Introduction

Land use change, occurring primarily in the form of deforestation, accounts for 20-25% of all greenhouse gas (GHG) emissions (UNFCCC, 2006). These trends are particularly visible in the tropics. Currently, the world's tropical forests are shrinking at 5% per decade and are projected to continue this decline for the next 30 to 50 years (Chomitz, 2006). This dramatic loss of biomass not

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[2] Nicholas School of the Environment and Earth Sciences, Duke University, Durham, North Carolina 27708.
[3] *Corresponding Author. UNEP Economics and Trade Branch (Division of Economics, Technology, Industry and Energy), International Environment House, 11-13 Chemin des Anèmones, CH-1219, Genève, Switzerland.
[4] The World Conservation Union (IUCN), 28 rue Mauverney, CH-1196 Gland , Switzerland.
[5] Independent Consultant, Place Chauderon 30, CH-1003 Lausanne, Switzerland.

only threatens the regulation of the global climate, but also the quality and quantity of global biodiversity and the ecosystem services[1] it provides to billions of people around the world.

The need for enhanced conservation and management of ecosystems and the services they provide to sustain and fulfill human life is increasingly dominating environmental discourse (Daily, 1997; MA, 2005). With 60-70% of the world's ecosystem services deteriorating as a result of anthropogenic activities, there is an urgent need to quantify, publicise, and internalise these latent values in both public policy and private behavior in order to ensure their sustained provision (MA, 2005). Payment for ecosystem services (PES) – in which the beneficiaries of ecosystem services pay suppliers of these services for their provision and maintenance – is an increasingly popular mechanism for generating funding and securing the sustainable supply of these valuable services (Gutman, 2003; Alban and Wunder, 2005; Robertson and Wunder, 2005). International PES (IPES) is currently being developed to address the financing of ecosystem services at the international level, notably in terms of matching providers and beneficiaries that reside in different countries (UNEP-IUCN, 2006).

International payments for carbon sequestration represent the most developed form of IPES. This is largely because the demand for carbon sequestration has been significantly boosted by the Kyoto Protocol's Clean Development Mechanism, under which carbon sequestration through afforestation or reforestation projects[2] can be used to offset polluters' internal GHG emissions. Other emission reduction initiatives have also implemented payments for carbon sequestration through similar offset arrangements.[3] In contrast, international payments for biodiversity conservation are less well-developed. Historically, the conservation of biodiversity has been pursued mainly through the national designation of protected areas. Payments for biodiversity conservation, while growing, remain largely a marginal phenomenon, instituted through forest and fisheries certification, hunting concessions, ecotourism, markets for biodiversity offsets and niche markets for products with high agricultural biodiversity value (Gutman, 2003).

The conservation of ecosystems – and of tropical forests in particular – can be seen as a means of ensuring environmental benefits both in terms of climate mitigation and biodiversity preservation. The ongoing discussion regarding the inclusion of existing forests[4] into international climate mitigation frameworks represents a significant opportunity for both climate and conservation efforts. Thus, acceptance of Reduced Emissions from Deforestation and Degradation (REDD)[5] as a viable international emissions abatement mechanism could offer an appropriate platform for developing IPES beyond carbon sequestration. Indeed, the protection of ecosystems through REDD generates an opportunity to define a 'bundle' of ecosystem services from a given area – including those enabled by carbon sequestration and biodiversity conservation. In this way, REDD can be seen as a tool not just for mitigating climate change, but also for conserving biodiversity and a range of ecosystem services of global and local interest.

This paper aims to offer an overview of the potential for REDD to mutually support the complementary environmental goals of biodiversity conservation and reduced GHG emissions through an IPES framework. While IPES might provide an appropriate framework within which international payments for avoiding deforestation could be instituted, many conceptual, technical, and political issues still need to be cleared up. The development of REDD also faces similar hurdles. As both debates progress, lessons learned along the way could be mutually reinforcing. By further exploring the potential of REDD to adjust the carbon-related IPES so that biodiversity benefits of forest conservation can be included, the authors hope to shed some light on potential pathways toward an effective joint approach to climate and conservation issues.

The first section sets out the theoretical framework for the paper, discussing the recent conceptual developments of IPES and REDD, as well as their position within the welfare economics perspective. After establishing an 'ecosystem services'-centered conceptual framework, the paper explores the opportunity REDD provides as a mechanism for linking payments for different forest-related ecosystem services – specifically, payments for reduced emissions and biodiversity conservation. The authors provide a basic overview of the evolving debate on REDD and instances of its practical implementation. This context is used to highlight the opportunity REDD presents for linking financing for climate and conservation efforts through IPES. The final section of the paper then introduces two basic models of implementing REDD through an IPES framework in an attempt to identify possible strategies for bundling payments for climate- and conservation-related ecosystem services.

II. Theoretical Framework

By addressing newly advanced concepts such as IPES and REDD in terms of more established welfare economics theory, the authors hope to identify approaches to REDD that will ensure that this cutting-edge conservation tool meets its full environmental potential. This section gives the basic theoretical context for this task.

A. Externalities and Public Goods

As a forest conservation strategy, REDD delivers a range of benefits and services, many of which are not formally included in a market transaction. These ancillary benefits, such as sustainable development, watershed protection or biodiversity conservation, are considered externalities and are therefore not ensured through markets. From a welfare economics perspective, an externality is present when (1) an individual's utility is affected by the activity of another agent without particular attention to the welfare of the individual and (2) the agent whose activity affects others' utility levels does not receive/pay compensation for this activity (an amount equal in value to the resulting benefits/costs to others) (Baumol and Oates, 1988). A public externality exists when the externality in question assumes the character of a public good. Specifically, the 'undepletable' nature of the externality – or 'jointness of supply' – extrapolates the change in utility experienced by one individual to the general population.[6]

Externalities – public or private – result in market failure, a scenario under which the marginal conditions of optimal resource allocation are violated (Buchanan and Stubblebine, 1962). In order to correct the market failure – or internalise the externality – payment or compensation to the responsible actor in the amount equal to the external benefit or cost needs to be made.

Biodiversity conservation is an example of a public good that takes the shape of a positive externality when delivered through REDD. Consequently, some kind of mechanism to incorporate a payment for biodiversity conservation within the market for REDD is necessary. Because biodiversity conservation is a public good, coming up with finances for this payment is a painstaking task. PES is one way to encourage financing for biodiversity conservation. The global nature of biodiversity benefits, however, makes IPES a more appropriate tool with which to address the biodiversity conservation externality delivered through REDD.

B. International Payments for Ecosystem Services

PES and IPES are environmental policies that can be used to address the market failures resulting from the exclusion of ecosystem services from markets. IPES is specifically apt for addressing the global public goods nature of biodiversity conservation.

The IPES concept emerged from growing concern about the loss of biodiversity and other ecosystem services and was bolstered by inspiration from the early success of the global carbon market and a desire to scale-up experience with PES at regional and national levels. It has recently gained recognition as a tool that can be used to address a range of global environmental issues (UNEP-IUCN, 2006). Currently, two environmental issues of global significance are beginning to be addressed through IPES: (1) the conservation of global use (e.g., genetic information) and non-use (e.g., existence, option and bequest) values provided by biodiversity and (2) the regulation of the global climate. These two issues are truly global in scope and require an international framework in which to address them.

In September 2006, UNEP and IUCN, with the support of the CBD Secretariat, convened a workshop of international experts in the field of PES to discuss the possibilities for and barriers to scaling up PES to the international level. The workshop concluded that while biodiversity was the environmental issue that would benefit most from the development of an international payment scheme, two main constraints hinder the implementation of such a system: (1) unclear supply – the quantification of biodiversity and identification of its providers remains problematic – and (2) limited demand – there is no strict mandate for international biodiversity conservation. Workshop participants concluded in a general consensus that 'building on' the carbon market by offering a bundled supply of ecosystem services – most specifically carbon sequestration and biodiversity conservation – could be a promising way forward (UNEP-IUCN, 2006).

By focusing on beneficiaries of ecosystem services, IPES has the potential to help tap into the funding potential of previously unengaged stakeholders. IPES addresses the core issue governing the under-provisioning of positive environmental externalities by providing a mechanism for these public goods to be priced and marketed in order to ensure their continued provision. In doing so, IPES provides a unique opportunity for the integration of climate and conservation issues under the common 'ecosystem services' framework. Specifically, approaching REDD through and IPES framework map help ensure that REDD delivers both climate and conservation benefits.

C. Reduced Emissions from Deforestation and Degradation (REDD)

At its most basic level, REDD is an emission abatement mechanism whereby greenhouse gas (GHG) emissions are reduced by decreasing deforestation and land degradation.[7] Thus, it represents a more specific type of land use, land use change and forestry (LULUCF) GHG reduction measure than afforestation and reforestation.[8] REDD focuses specifically on the conservation of existing carbon stocks in biomass[9] as distinct from afforestation and reforestation which aim to sequester carbon from the atmosphere through tree planting and growth.

Although a REDD offset mechanism was ultimately excluded in the first commitment period of the Kyoto Protocol, it has reemerged as a topic for debate preceding the second round of negotiations, now under the title of REDD.[10] As a result, the inclusion of REDD is a top priority for discussions concerning the post-2012 commitment period for the Protocol and will most-likely feature prominently as an issue at the COP13 in December 2007 (see UNFCCC, 2006). The development of new satellite monitoring and carbon accounting techniques – some of the key stumbling blocks to the inclusion of avoided deforestation in the initial Kyoto agreement – have recently begun to tip the scales, forcing policymakers to reconsider REDD as a potential ERO (DeFries et al., 2000; Fearnside, 2001; Achard et al., 2005). Nevertheless, the success of REDD in the next round of discussions is by no means guaranteed (Persson and Azar, 2004; Santilli et al., 2005).

REDD is unique among EROs in that it offers a tool with which to provide a number of forest-related ecosystem services in addition to reduced emissions from continued carbon sequestration. In terms of payments for ecosystem services, however, REDD is most typically considered only a payment for reduced emissions. Payments for other benefits – most notably biodiversity conservation – are not included. Without these payments, REDD not only loses a considerable source of financing, but also the provision of the ancillary benefits that make REDD such a desirable ERO may be compromised.

It is our hope that the growing popularity of the 'ecosystem services' concept and the corresponding IPES conservation finance mechanism can be used to ensure REDD delivers both climate and conservation benefits. In an attempt to ensure a 'climate-conservation' double dividend, we explore how biodiversity conservation benefits can be effectively internalised into markets for REDD. Specifically, we focus on the opportunity IPES provides for securing this internalisation. Before we further explore how biodiversity conservation might be incorporated into transactions for REDD under an IPES framework, we will first inform this exploration by outlining how REDD may eventually be implemented, both in a regulatory context and beyond.

III. The Progression and Viability of REDD as an Emission Reduction Option

While the potential to generate carbon offsets from avoiding deforestation has been discussed for some time,[11] consensus on the viability of REDD as an effective emissions reduction option (ERO) has yet to be reached. The debate dominating REDD discourse is not a product of ambiguity over the assumption that decreasing deforestation will also reduce GHG emissions. Rather, the controversy stems from the extreme difficulties inherent in reducing deforestation at the global level as the drivers of deforestation are diverse, layered and synergistically linked (Geist and Lambin, 2002). Deeply rooted in socio-economic context, these forces continue to jeopardize the establishment of REDD as a credible ERO. Furthermore, questions concerning the viable implementation of REDD and its potential to cope with issues such as establishing baselines, leakage, non-permanence and additionality have impeded its adoption within carbon markets (Persson and Azar, 2004; Schlamadinger et al., 2004; Schlamadinger et al., 2007). Despite these issues, REDD has progressed considerably over the years to become a seriously considered potential ERO in mandatory markets and under pilot implementation in voluntary markets.

A. REDD in mandatory markets

Currently, carbon sequestration credits under the CDM can be generated from either afforestation or reforestation activities,[12] but not avoided deforestation. Discussion of REDD during the UNFCCC COP11 in 2005, however, resulted in the establishment of a two year period in which relevant scientific, technical and methodological issues concerning the mechanism would be reviewed and policy approaches considered. As a part of the technical review process, the UNFCCC held two workshop on '*Reducing Emissions from Deforestation in Developing Countries'* (30 August – 1 September 2006 in Rome, Italy and 7-9 March 2007 in Cairns, Australia). In preparation for the workshops, 21 submissions were received representing the views of 68 Parties (UNFCCC 2006). A number of these submissions offered plans for the implementation of REDD schemes that would provide a credit similar to Certified Emission Reductions (CERs) that could be exchanged on the international market. Other submissions suggested funding REDD outside of carbon markets, in the form of official development assistance or some sort of global fund. Despite their diversity, most proposals concluded that some form of REDD would be advantageous for both combating climate change and financing conservation (UNFCCC, 2006). The discussion over the inclusion of REDD in a post-2012 GHG emissions reduction strategy is planned to continue at UNFCCC COP 13 and COP/MOP3 of the Kyoto Protocol.

Other mandatory markets linked to Kyoto (the European Union Emissions Trading Scheme (EU ETS) and the United Kingdom Emissions Trading Scheme (UK ETS)) – as well as those completely outside of the Kyoto framework (the Regional Greenhouse Gas Initiative (RGGI) and the New South Whales Greenhouse Gas Abatement Scheme (GGAS)) – have also excluded REDD as an offset possibility. Exclusion from mandatory carbon markets has severely limited REDD's potential for reducing GHG emissions, making voluntary markets and non-market funding the leaders in delivering REDD.

B. REDD in voluntary markets

Voluntary carbon markets provided the first financing for forest conservation as a means of reducing GHG emissions (Hamilton et al., 2007; Brand and Meizlish, 2006). These voluntary REDD deals have thus far been pursued mostly by the non-profit sector. The Nature Conservancy and Conservation International have been particularly active in reducing GHG emissions through forest conservation strategies. Typically these conservation projects combine components of reforestation and reducing deforestation in order to achieve overall reduced emissions, biodiversity protection and local development goals. A small number of these projects have focused on reducing deforestation exclusively, while gaining verified emission reductions (VERs) through voluntary markets.

The Noel Kempff Climate Action Project, led by the Nature Conservancy and FAN Bolivia, is an early example of a REDD project generating carbon credits. Beginning in 1997, the project incorporated 832,000 hectares of tropical forest into the adjacent Noel Kempff Mercado National Park in Northeastern Bolivia (TNC and FAN Bolivia, 2005). In November 2005 the project was certified by a third-party evaluator and the project has since received 1,034,170 tCO2e in offsets at a price of US$4.00/tCO2e. The early off-sets are pre-registered for sale in the Chicago Climate Exchange (CCX),[13] with a commitment by CCX to follow through with the rest.[14] A similar project led by Conservation International and managed by the Wildlife Conservation Society (WCS), the Makira Forest Project, preserves 350,000 hectares of tropical forest in the northeastern region of Madagascar. The project aims to reduce deforestation to 0.07 percent (the rate found in nearby national parks) and, according to independent assessment, will mitigate 9.5 million tons of carbon dioxide emissions over the next 30 years and make them available for sale as offsets in retail markets (CELB, 2006).

The World Bank has also been prominent in spearheading REDD initiatives. In March 2007, Tranche Two of the BioCarbon fund was launched with the explicit aim of investing in REDD. This tranche of the fund plans to collect over $50 million from the public and private sector and direct these investments toward REDD projects with positive linkages between reduced emissions, biodiversity, and development (World Bank, 2004; Capoor and Ambrosi, 2007). The World Bank has also recently launched the Forest Carbon Partnership Facility (FCPF) which aims to contribute a target sum of $250 million to efforts in developing countries to implement REDD. The facility, ultimately intended to set the stage for a large-scale system of positive incentives for reducing the rate of deforestation and forest degradation, will provide funding for capacity building and pilot performance-based payments to select developing countries that implement REDD activities (Capoor and Ambrosi, 2007).

Over 50% of offsets provided on retail markets are from land use, land use change and forestry (LULUCF) projects (Harris, 2006), while 13% of the offsets sold on the CCX are generated through forestry projects (CCX, 2007). REDD, while growing in popularity, still only comprises a small amount of these forestry-generated offsets. Those projects that do generate offsets through REDD, as indicated by the previous examples, are typically pursued by large international organisations in order to generate a range of benefits aside from purely emissions reductions. They resemble typical official development assistance (ODA) sector programs in that they attempt to address the underlying drivers of deforestation synergistically by combining legal and institutional instruments (Deutsche, 2007). Consequently, REDD projects are typically complex and burdensome to manage, requiring significant supervision to ensure successful implementation. For this reason, REDD projects to date have been conducted largely by large, international, non-profit organisations investing not only in reduced emissions, but a wide range of public goods.

C. REDD as a Competitive ERO

With the development of new methodologies in carbon accounting, measuring leakage and establishing baselines (DeFries et al., 2000; Fearnside, 2001; Achard et al., 2005), REDD has the potential to become an increasingly attractive ERO. Although still in a 'pilot' phase, ongoing REDD projects are helping to strengthen its credibility as a viable offsetting mechanism. In addition to credibility, the cost of REDD is an important dimension that will influence its popularity among for-profit investors. Factors influencing price include: opportunity cost (US$/ha), administrative costs (US$/ha), and estimates for the amount of carbon sequestered in biomass (tC/ha). These indicators are all highly variable, and when combined, yield significantly different estimates for the per hectare price of REDD. In order to provide a general range of per hectare price estimates for REDD projects, the authors focus on the two most substantial factors influencing cost – opportunity cost and biomass.

The opportunity cost of avoiding deforestation depends on the driver of forest loss and/or ecosystem degradation. Land use change, demand for wood and agricultural products, mineral extraction, power generation and resettlement of land access, such as new roads and processing centers are all potential drivers of deforestation and degradation (RSPB, 2007). Each factor yields a different opportunity cost. Thus, estimated opportunity costs vary greatly between and within countries (see Appendix 1). Ranges for opportunity cost have been found to be as different as US$ 2 – 2,605 per ha in Brazil, with maximum opportunity cost to be US$2,705/ha for large scale oil palm in Malaysia and Indonesia (Grieg-Gran, 2006). Although it can be considered as being slightly arbitrary, the average opportunity costs in this study are US$1,202/ha (Grieg-Gran, 2006).

Estimates of forest biomass indicate the amount of reduced emissions from avoided deforestation and thus the number of credits received through the project. There is a lot of uncertainty around forest biomass and, consequently, there is also uncertainty over the flux of carbon from land-use change. The IPCC Third Assessment report provides some evidence of the range scientists have found with respect to forest biomass (IPPC, 2001). While WBGU (1988) estimated a carbon density of 120 tC/ha in tropical forests (excluding soil), Mooney et al. (2001) estimated a density of 194 tC/ha for the same biome. In addition, Nabuurs (2007)[15] estimates that forest biomass (excluding carbon in soil and other vegetation) is at least 120 tC/ha for forests in the *tropics*. Although there is likely more data available regarding carbon density in forest biomass, the above numbers can be used to provide a rough estimate for the price of a REDD credit. However, it should be understood that these concern price ranges for REDD credits in tropical countries, and that outside tropical countries, forests often contain much less above-ground biomass (IPCC, 2001). When one considers the fact that opportunity costs of boreal forests are likely to be significantly higher, the expected price range for a REDD credit in boreal forests is probably much higher than in tropical ecosystems.

Based on estimated opportunity costs and forest biomass densities for tropical countries, Table 1 provides a very rough range of estimates for the price of REDD in \$/tCO2-eq. Within this range, \$5.2/tCO2-eq is the highest estimated price for REDD and \$0.9/tCO2-eq is the lowest. This rough estimate is certainly in the lower price range for credits sold on mandatory markets, which can reach as high as \$20/tCO2-eq, and is on par with credits sold on the CCX, which range from \$3-5/tCO2-eq.[16] These price estimates indicate that if credible carbon accounting and monitoring methodologies can be successfully employed, REDD has the potential to be a competitive ERO within the carbon markets, especially for tropical forests ecosystems, which on average have relatively high biomass values and relatively low opportunity costs.

Table 1. Price estimates for REDD (in $/tCO_2$-eq).

Costs of not deforesting	**Lower bound (US$2/ha)**	**Higher bound (US$2,705/ha)**	**Average (US$1,202/ha)**
Forest biomass			
Average (120 tC/ha = 394 tCO_2-eq/ha)	0.005	6.9	3.1
Higher bound (194 tC/ha = 637 tCO_2-eq/ha)	0.003	4.3	1.9

IV. The Future of REDD: Voluntary and Mandatory

With its potential to be a credible and competitive ERO, examining possible future configurations of REDD is critically important to our latter exploration of internalising the biodiversity conservation component of REDD through an IPES framework. This section briefly reviews the anticipated shape of REDD as an ERO in both mandatory and voluntary markets.

A. On the mandatory front

The future of REDD in terms of UNFCCC certified markets will be significantly influenced by the outcome of Bali's discussions. While there is much contraversy over the form REDD should take if it is to be included in post-2012 commitments under the UNFCCC, policy-makers and academics have placed an emphasis on a sector-wide national approach to REDD.[17]

Two national plans to address REDD have gained wide recognition throughout the international community.[18] In the first comprehensive plan, referred to as Compensated Reductions (CR), non-Annex I countries voluntarily negotiate a national deforestation baseline based on historical deforestation rates.[19] National deforestation rates during a specified commitment period are then compared to this baseline. Reductions in emissions resulting from decreased deforestation are credited to the country at the end of the commitment period in the form of CERs, or a similar currency, and sold to other governments or international carbon investors.[20] Another nationally-based, REDD-incorporation strategy compares national historical deforestation baselines to a global deforestation average.[21] Countries with deforestation rates above half the global average are credited for reductions in deforestation from their national baseline, while countries with deforestation rates below half the global average are credited if they do not increase their deforestation from the established baseline.[22]

Despite the uncertainty over whether such nationally-based activities will be included in post-2012 commitments, the World Bank, through their Forest Carbon Partnership Facility of $250 million, has already planned pilot payments to national governments in the developing world in exchange for reduced deforestation. The program was organised with the explicit hope that certified credits for these payments would be received if a national approach to REDD was included under the UNFCCC in the future (World Bank, 2007). Thus, while the future of REDD under the Kyoto Protocol is uncertain (as is the future of Kyoto itself), much thought and financing from both the public and private sector has been and will continue to be spent developing a viable implementation strategy. In addition, organisations such as the World Bank have already begun to pilot its implementation in accordance with current proposals.

B. On the voluntary front

In terms of voluntary markets, the future of REDD appears more secure. Global carbon markets have tripled in size over the past year, and doubled the year before that (Capoor and Ambrosi, 2007; Capoor and Ambrosi, 2006). Voluntary markets represent a substantial amount of this growth (Hamilton et al., 2007). While still small compared to mandatory markets (voluntary markets are at an estimated worth of US$100 million compared to US$30 billion for all regulated markets combined; Hamilton et al., 2007), voluntary markets have seen "dramatic growth" since 2003 (Capoor and Ambrosi, 2007) and are projected to continue this accelerated growth well into 2007 (Hamilton et al. 2007). Experts predict that by 2010 voluntary markets will reach as high as 400 MtCO2e – a volume of carbon approaching that which is currently traded through the CDM (ICF, 2006). As voluntary carbon markets expand, REDD should grow proportionately.

REDD and other forestry projects are likely candidates for growth within the range of possible carbon offsets. Different in many ways from other carbon offset projects such as hydroflourocarbon (HFC) destruction, biomass energy and landfill gas reduction, forestry projects offers a way for carbon investors to diversify their portfolios (Ecosystem Marketplace and BSR, 2006; Taiyab, 2006). Investors understand where their offsets are coming from and the tangible processes through which they are generated (i.e., planting and/or conserving forest land). Forestry projects that provide environmental co-benefits specifically have been and continue to be a main preference for offset purchasers (Hamilton et al., 2007).

While forestry projects in general and REDD specifically continue to be a dominating source of offsets in voluntary markets, the nature of the projects which generate these offsets are changing. In 2002, the voluntary market was dominated by a few large players and the main transactions comprising the market were large forestry-related deals carried out by large conservation organisations (Hamilton et al., 2007). By 2006, however, the top sellers within the voluntary market only accounted for 60% of the offsets sold, with the remaining offsets being generated through a number of retailers, brokers and project developers (Hamilton et al., 2007). Voluntary markets are becoming more diverse and more competitive. Within this transition, the impending shift from non-profit to for-profit participants is becoming clearer.

This shift from philanthropy to venture capitalism and 'smart money' (Clean Air-Cool Planet, 2006), or an aptly described 'tCO2e-frenzy' (Capoor and Ambrosi, 2007), has elicited new investments in emission reduction projects.[23] As demand for offsets increases, the private sector is likely to pioneer new sources of supply. Given a competitive price and a solidified credibility, the popularity of REDD as an ERO should grow with the carbon markets. Thus, an increase in for-profit investments in offsets in general, and in REDD in particular, is likely to occur. Although such a development will surely bring significant risks, active for-profit participation in REDD could also provide some interesting opportunities.

V. The non-profit to for-profit trade-off

As noted, increased demand for offsets either through mandatory or voluntary markets is likely to cause an expansion of for-profit investment in REDD. This will inevitably imply a fundamental shift in the way that REDD projects are implemented. In the context of this non-profit to for-profit transition, the authors focus not on how REDD should be supported generally, but instead, on how the progression of REDD can be guided in order to ensure that it provides the greatest environmental benefits. We specifically examine the trade-offs inherent in the non-profit to for-profit transition.

Remaining within a project basis, this section compares the structural differences between non-profit and for-profit REDD projects in order to highlight the opportunity IPES presents for maximising environmental benefits in the for-profit scenario by combining payments for reduced emissions and biodiversity conservation into one investment in REDD. While this paper specifically considers the environmental implications of a for-profit transition in REDD and how biodiversity conservation can be maximised under for-profit investment, examining the social implications of this transition and possible vehicles for maximising the social benefits of for-profit investment in REDD is an equally – if not more – important task. Exploring the social implications of for-profit investment in REDD is outside the scope of this paper, but certainly deserves attention in future research (see Ayers and Huq, 2006).

A. Non-profit REDD projects

Most projects planned and implemented thus far have been implemented either by development agencies or by international non-profit organisations. These voluntary deals assume one of two basic structures, both of which involve a large, non-profit organisation as the implementing agency. In the first scenario, the non-profit organisation secures funding from carbon investors for a specific project and supplements these finances with their own organisational funding. In the second scenario, the non-profit organisation acts only as a coordinator of the financing process, securing general funding and then allocating it among different projects.

Figure 1 illustrates the structure of REDD projects under the first scenario, in which a non-profit directs and supplements investment in REDD. In this model, carbon investors transfer money to the implementing organisation, which combines these funds with their own financial contribution and directs the total amount to a specific REDD project. The Noel Kempff and Makira Forest projects described earlier follow this basic structure. Credits generated through the project (verified emission reductions, VERs) are awarded to the implementing organisation, which then reallocates them to investors according to their financial contribution. The additional finances provided by the implementing organisation are used to ensure that both climate and conservation goals are achieved through the project. The biodiversity conservation provided under this scenario, therefore, is ensured by the implementing organisation, not the outside investors.

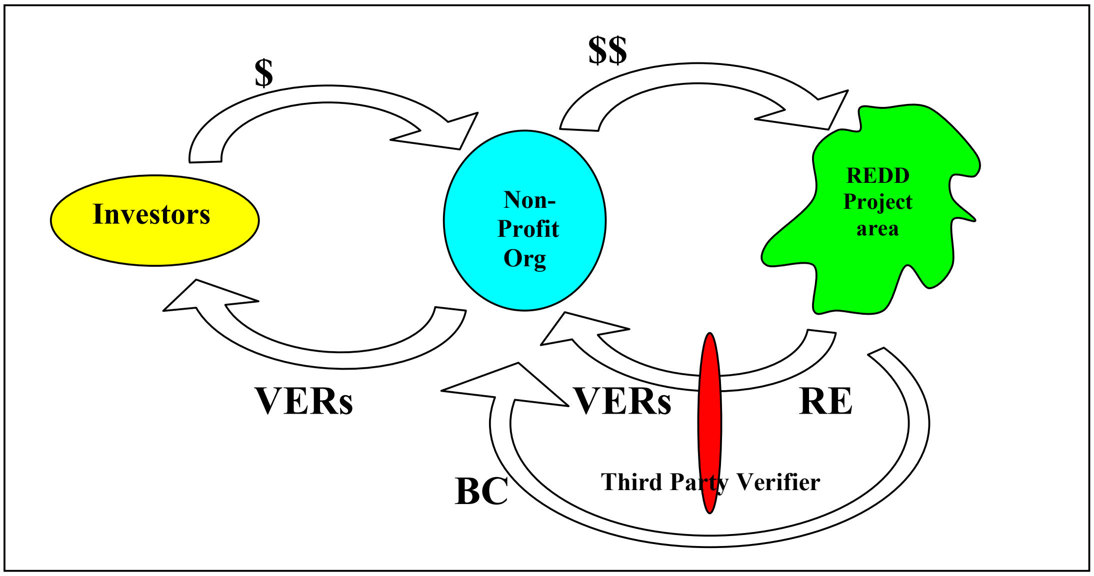

Figure 1. Non-profit that direct and supplements investments in REDD.
VERs = verified emission reductions; BC= biodiversity conservation; RE = reduced emissions.

Under the alternative scheme, the implementing organisation acts as a coordinating agency, collecting contributions from willing investors, while making no additional contribution (Figure 2). This scenario follows a more centralised approach in that the implementing organisation coordinates multiple projects at one time and investors invest generally in the initiative, not on a site-specific basis. The World Bank's BioCarbon Fund is an example of this type of 'non-site-specific' investment in REDD. While the implementing organisation ensures that both climate and conservation goals are achieved by picking appropriate projects (as in the previous model), in this model the investors – not the implementing organisation – are paying for the provision of both services. The investors, therefore, are investing in both reduced emissions and biodiversity conservation (and perhaps a number of other ecosystem services). Because of economies of scale, investors in all sorts of forest-related ecosystem services can be grouped together and jointly managed by a single institution. While such a centralised system will surely lower the overall transaction costs of implementing REDD at a global scale, it will also have greater difficulty adapting to whichever site-specific issues arise in various localised contexts.

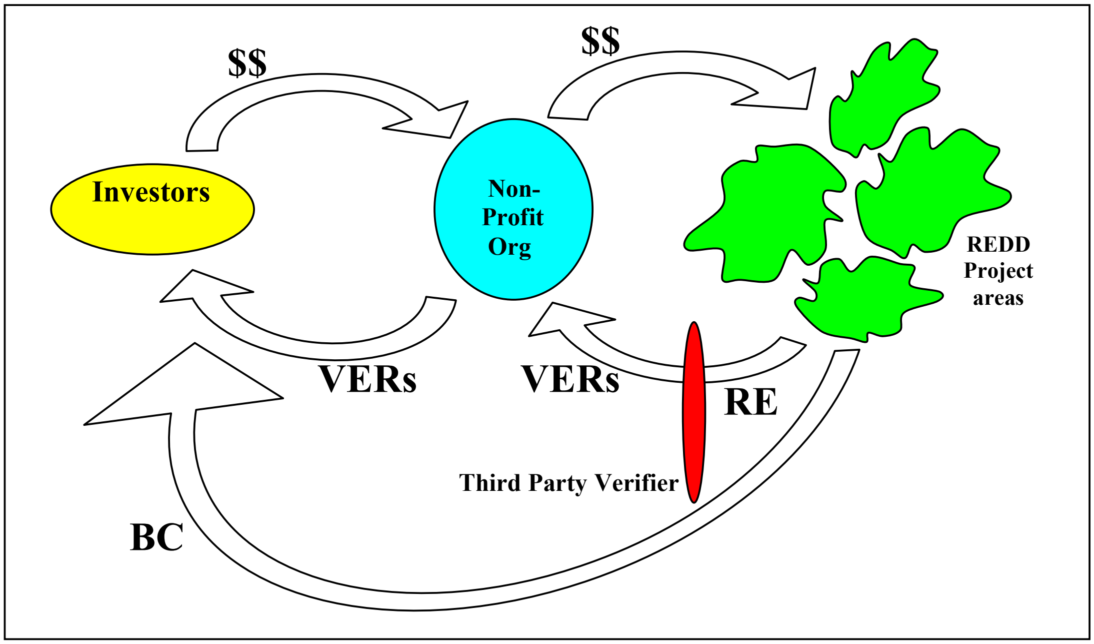

Figure 2. Non-profit that directs and coordinates investments in REDD without adding an internal contribution. VERs = verified emission reductions; BC = biodiversity conservation; RE = reduced emissions.

REDD projects pursued under both of these models are reflective of the broader objectives of non-profit organisation implementing them. These broad objectives may consist of a variety of social and environmental goals, but for the purpose of this paper we focus specifically on biodiversity conservation. While in the latter scheme biodiversity conservation is financed by the investors and not the implementing organisation, the implementing organisation is responsible in both cases for selecting the appropriate project location and for effectively implementing the forest protection measures. In both cases, therefore, a climate-conservation double dividend has been ensured by the involvement of non-profits acting as project directors. Thus, if the non-profit organisation is removed from the picture, there is no longer any actor ensuring that the environmental benefits delivered through the project are maximised. Specifically, there is no actor ensuring the biodiversity conservation aspect of the project.

B. For-profit REDD projects

In for-profit investment in REDD, the non-profit implementing organisation is replaced with a carbon investor investing in offsets as a for-profit enterprise. For-profit investments in REDD could follow the same strategy as for-profit investments in other offset projects. In this model, payments for REDD projects are made only by the carbon investor in return for emission reduction credits (Figure 3). Any biodiversity conservation benefits will remain external to the payment, thus comprising a positive externality. Biodiversity conservation under for-profit investment is not a central consideration, it is a potential positive externality. Consequently, biodiversity conservation benefits delivered through

REDD will most likely not be maximised as there is no incentive for a for-profit REDD project to deliver a climate-conservation double dividend.

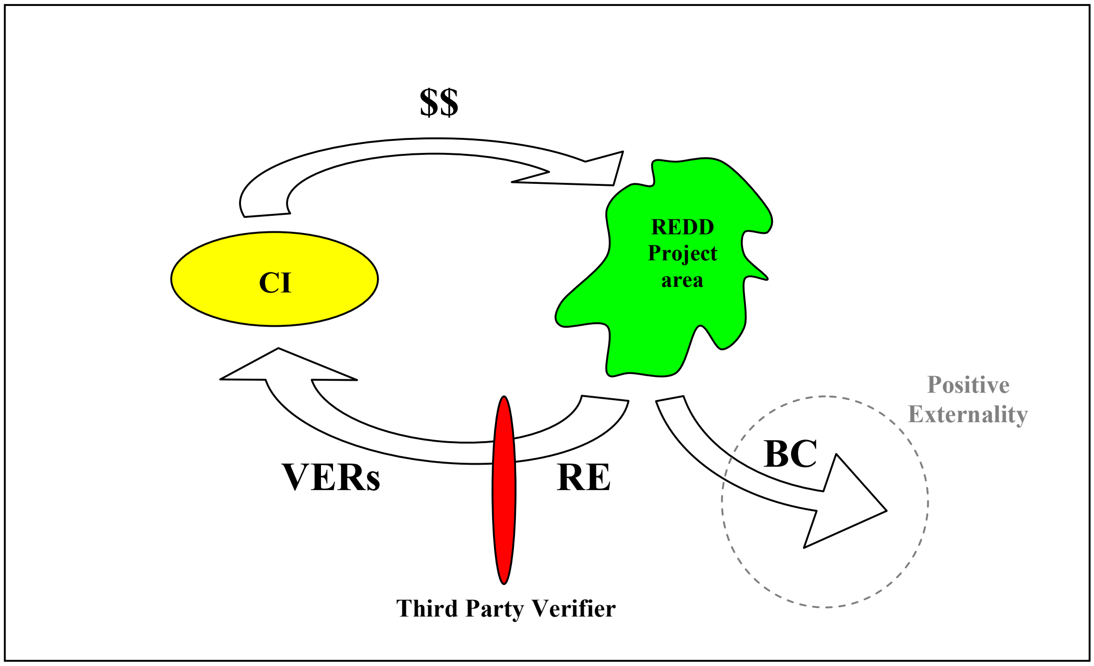

Figure 3. For-profit investment in REDD.
VERs = verified emission reductions; CI = carbon investor; BC = biodiversity conservation; RE = reduced emissions.

Unlike non-profit projects to date, for-profit investments require REDD to be a competitive ERO that delivers low-cost VERs (or CERs if included in the post-2012 regulated market). Thus, in the pursuit to maximise profit by securing the lowest price, the biodiversity benefits REDD provides (one of the characteristics that makes REDD such a desirable ERO in the first place) may be compromised.

This tendency is not specific to REDD. Projects under the CDM have demonstrated a similar inclination to compromise overall benefits in an attempt to minimise costs. Indeed, many criticize the CDM for failing to meet its objective of sustainable development at the expense of low-cost emissions mitigation (Kill, 2001; Sim et al., 2004; Wara, 2006). In terms of biodiversity, REDD may face the same compromise. While REDD pilot projects have thus far been relatively successful at achieving biodiversity benefits, an embrace by for-profit carbon investors may reverse this trend. Without an incentive structure capable of encouraging REDD projects to effectively deliver a climate-conservation double dividend, a valuable conservation instrument will be lost to single-criterion environmental regulation and profit maximisation.

VI. Guiding the non-profit to for-profit transition: An IPES opportunity?

In light of the impending non-profit to for-profit transition described in the previous section, this section explores ways IPES can be used as a framework in which to guide this transition so that both the climate and conservation benefits REDD has the potential to provide are maintained.

A. Certification vs. Bundling

There are a number of ways one can institute an incentive structure to encourage for-profit investment in REDD projects that deliver both reduced emissions and biodiversity conservation. Perhaps the most obvious approach is basic certification. Certification of high biodiversity REDD projects allows for a segmented market by differentiating offsets that also deliver biodiversity conservation from those that provide only reduced emissions. This differentiation allows offset buyers actively seeking co-benefits to pay a premium for biodiversity conservation. However, the success of certification is highly dependent on the legitimacy and credibility of the organisation offering the certificates. To date, there still are serious political, technical, and financial challenges that need to be overcome before a globally accepted REDD label can be expected to take effect (see Rametesteiner and Simula, 2003).

While certification is useful because it provides a segmented market for actors seeking offsets with co-benefits, certification does not provide a market for actors exclusively interested in financing biodiversity conservation (i.e., not interested in buying carbon offsets). Certification therefore requires both payments for reduced emissions and biodiversity conservation to come form one actor. Actors interested in only biodiversity conservation instead might benefit from some other form of cost-sharing with carbon investors. A vehicle for sharing the cost of investment would allow biodiversity beneficiaries to provide an additional financial incentive to ensure the delivery of biodiversity benefits, rather than requiring these beneficiaries to invest in the total package of reduced emissions and biodiversity conservation. Thus, a mechanism to combine payments from distinct beneficiaries into one overall investment that secures both benefits – reduced emissions and biodiversity conservation – could be an interesting alternative means of generating financing for biodiversity conservation through REDD.

IPES provides a framework for combining – or bundling – payments from diverse environmental beneficiaries into one payment for REDD. Indeed, the specific focus on the beneficiaries of ecosystem services inherent to IPES serves as an appropriate entry point for establishing a system for combining payments for reduced emissions and biodiversity conservation through REDD. By targeting the beneficiaries of different ecosystem services and providing a market through which these different beneficiaries can finance the continued provision of the service, IPES addresses the core of the cost-sharing issue. More importantly, the re-framing of environmental stewardship into the 'beneficiary pays' principle could actually help reach out to previously unengaged actors – especially in the private sector. Thus, by identifying the multiple beneficiaries (both direct and indirect) of REDD, the IPES approach could help tap into additional sources of funding, while at the same time, avoid compromising the biodiversity benefits REDD provides.

B. Incorporating payments for biodiversity conservation into REDD

Financing REDD through a cost-sharing approach requires at least two sources of payment – one for reduced emissions and one for biodiversity conservation. The source of the payment for reduced emissions is clear, but exactly who should provide the payment for biodiversity conservation is debatable. Under an IPES framework, beneficiaries of ecosystem services pay for their provision. According to this 'beneficiary pays principle', the beneficiaries of biodiversity-related ecosystem services should provide the additional payment to ensure biodiversity conservation through REDD. Thus, bundling payments for ecosystem services through REDD will provide an incentive structure encouraging for-profit REDD projects to deliver more conservation benefits by tapping into an additional source of finance.

This bundling exercise will entail a structural change in the for-profit investment in REDD described in the previous section. Graphically, Figure 4 illustrates for-profit investment in REDD under this IPES-inspired cost-sharing approach. This figure highlights the existence of a 'biodiversity beneficiary' who is financing the conservation benefits that might otherwise be left external to the carbon market. Such an approach to REDD formally internalises otherwise ancillary biodiversity benefits, thereby ensuring that these biodiversity benefits are delivered at the market efficient level. In this model, contributions for reduced emissions and biodiversity conservation are combined to ensure both benefits are delivered at an overall lower cost. The overall viability of this model is dependent on the existence of an IPES mechanism capable of ensuring that the different investors (or beneficiaries) have a common platform through which they can jointly support REDD projects. Thus, 'bundling' ecosystem services would be the main function of the eventual IPES institution responsible for implementing this model of REDD.

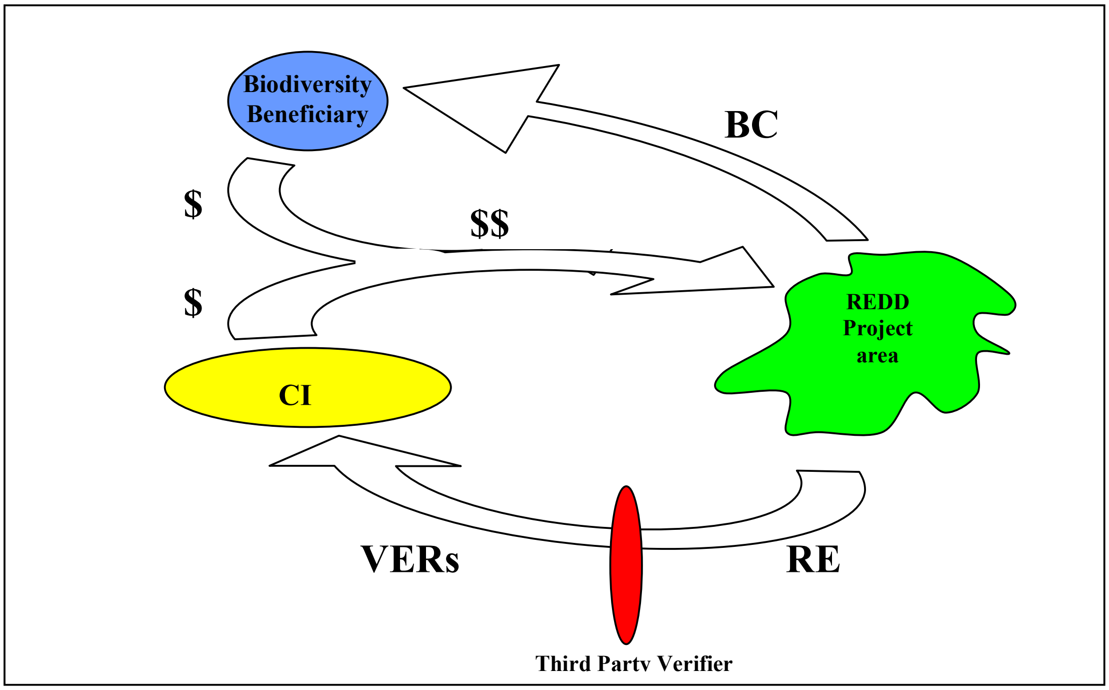

Figure 4. For-profit investment in REDD through cost-sharing.
VERs = verified emission reductions; BC= biodiversity conservation; CI = carbon investor; RE = reduced emissions.

This form of cost-sharing can be applied to REDD on a project basis for carbon credits generated in either voluntary or mandatory markets. However, if mandatory markets, specifically those certified under the UNFCCC, assume a national or regional approach to REDD as is predicted (and described above), Figure 4 will not be applicable. In fact, bundling payments from carbon investors and biodiversity beneficiaries – as illustrated in Figure 4 – in a system that awards credits to national governments appears to be quite difficult. One must realise, however, that even though national governments are awarded the credits, reduced deforestation must still take place on a project level. Credits are simply rewarded on aggregate to the government which will then distribute either the credits or financial compensation at its own discretion. Viewed in this light, it is still possible to apply the bundling approach, as described above, to a nationally-based approach to REDD.

Figure 5 depicts how this can be done. Credits for reduced deforestation are awarded to the State ex post according to whichever (if any) nationally-based regime is implemented post-2012. The State then acts as an intermediary, rewarding credits to either private investors for their REDD projects (Figure 5B) or investing in REDD themselves (Figure 5A). Both scenarios (A and B), since taking place on a project basis, may incorporate compensatory payments for biodiversity conservation through an IPES mechanism as illustrated in Figure 4.

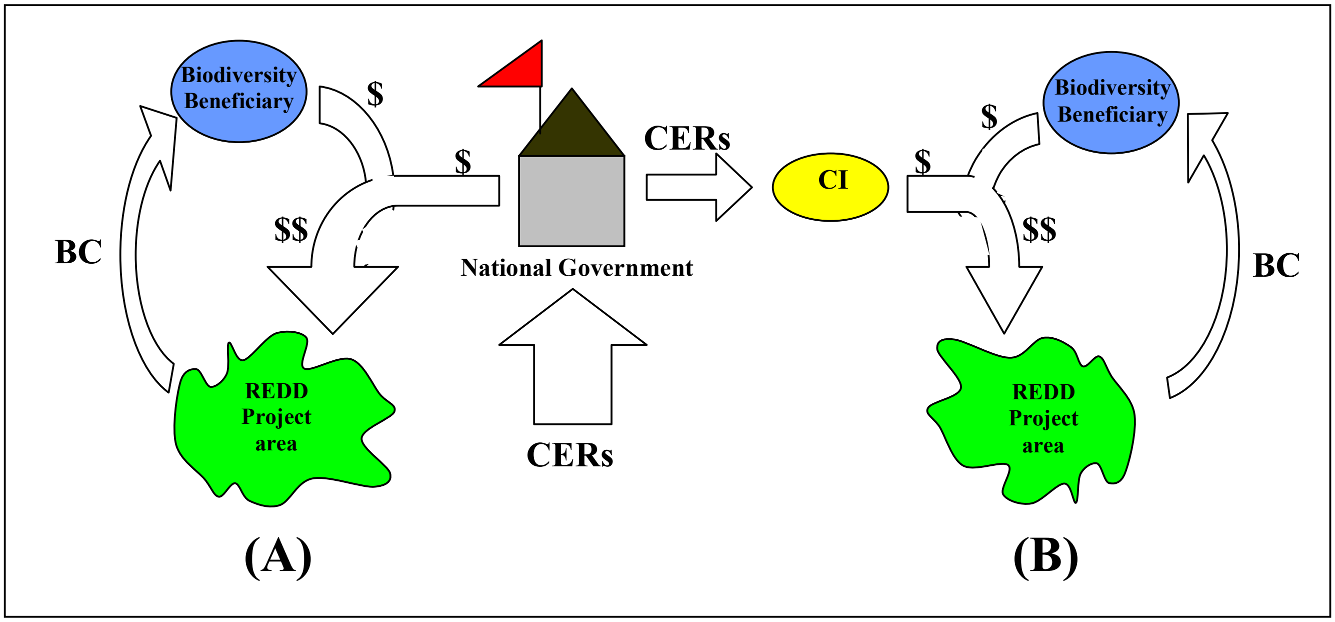

Figure 5. A national approach to bundling payments for REDD. (A) State invests in REDD and retains credits for sale on UNFCCC approved carbon markets or (B) private actor invests in REDD in cooperation with the state, receiving credits from the state in exchange for reduced deforestation.
CERs = certified emission reductions; BC = biodiversity conservation; CI = carbon investor.

C. Targeting biodiversity beneficiaries: General vs. Site-specific

Determining the non-carbon beneficiaries of REDD projects can be difficult, especially in terms of biodiversity benefits, which may be provided at the global, regional or local level.[24] Other ecosystem services, such as watershed protection, plant pollination, or storm buffering, are often very context-specific, and therefore have a more localized relevance. For the purpose of this paper, we will focus specifically on the conservation of globally significant biodiversity as an international ecosystem service. This relates to the use (e.g. genetic information) and non-use values (e.g. existence, option, and bequest) of preserving tropical forests.

The authors generalize two types of groups that demand biodiversity protection: general beneficiaries and specific beneficiaries. General beneficiaries are a globally diffuse set of actors who demand general conservation efforts for the option, existence and bequest values they provide. While a wide range of international actors comprise this group, the most obvious example is the middle- and upper-class resident of the developed world who likes the idea of conserving biodiversity and may or may not plan to travel to certain biologically diverse areas, but nonetheless wants to have the piece of mind that they exist in their natural state. General biodiversity beneficiaries result from the global public goods nature of biodiversity.

Site-specific beneficiaries, conversely, are those groups that benefit from the conservation of biodiversity within a specific area. Unlike general beneficiaries, these groups typically demand biodiversity protection for a specific use value it provides. They demand biodiversity for its role in preserving a certain cultural heritage, for its contribution to human knowledge, or for its contribution to the overall resilience and/or productivity of ecosystems (Heal, 1999). Agriculturalists, insurance companies, water utilities, pharmaceutical companies, research institutions, ecotourism companies, NGOs, and governments are just a few examples of these more site-specific beneficiaries of biodiversity-related ecosystem services.[25]

Based on these two groups of biodiversity beneficiaries, the authors consider two methods through which payments from biodiversity beneficiaries can be combined with payments from offset providers investing in high-biodiversity REDD projects – in other words, two ways to bundle payments for reduced emissions with payments for biodiversity conservation. The first method combines finances from general biodiversity beneficiaries with investments in REDD through a 'global fund'. In contrast, the second method matches payments from specific biodiversity beneficiaries with investments in REDD through a payment 'partnership' between both groups.

Table 2 provides an overview of these two options for bundling payments for reduced emissions and biodiversity conservation, along with a description of the certification approach discussed earlier, which requires both payments to come from one actor (and therefore does not take advantage of the opportunity for cost-sharing). The remainder or the paper will discuss the fund and partnership options for bundling payments for reduced emissions and biodiversity conservation through REDD.

Table 2. Three options for incentivising investment in high-biodiversity REDD projects.

Mechanism	Description
Certification	Differentiates those offsets generated through REDD projects protecting high biodiversity forests from those offsets generated through the protection of less diverse forests with a certificate. This differentiation creates a segmented market for offset purchasers actively seeking offsets that also deliver biodiversity benefits.
Global Fund	Offers a per-hectare payment to REDD projects protecting high-biodiversity forests. This payment – financed through a centralised fund – combines contributions from general biodiversity beneficiaries with carbon investments in REDD.
Partnership	Establishes partnerships between actors investing in biodiversity conservation and actors investing in reduced emissions through REDD. Payments from specific biodiversity beneficiaries are therefore combined with carbon investments in REDD through a payment partnership.

D. The centralised 'global fund' option

The first method of compensation draws finances from general biodiversity beneficiaries through a global fund. This fund would be used to provide a per-hectare payment for biodiversity conservation to those REDD projects located in high-biodiversity areas. The bundled payment for reduced emissions and biodiversity conservation will therefore come from the carbon investors investing in reduced emissions and the fund providing an additional payment for biodiversity conservation to those carbon investors that select high-biodiversity sites. By slightly lowering the price of investing in high-biodiversity REDD projects through the incorporation of a centrally provided 'biodiversity payment', a fund will encourage those actors already investing in REDD to chose projects that protect high biodiversity forests. In this way, the fund can leverage private sector investment in reduced emissions for biodiversity conservation purposes. Biodiversity conservation funds otherwise intended to finance entire conservation projects can therefore go further in terms of generating 'more bang for your buck' by combining resources with carbon investors already investing in REDD.

The fund can therefore be viewed as similar to the World Bank's BioCarbon Fund or Forest Carbon Partnership Facility in that is compiles contributions from a range of actors and distributes the financing globally. This difference is that, in this case, the fund would not be used to wholly invest in REDD projects, but rather, provide only a payment for the biodiversity conservation delivered through the project. It provides a vehicle with which to combine payments from general biodiversity beneficiaries with carbon investments in REDD.

A fund is appealing because it addresses the global dimension of biodiversity values. Also, because of its centralised nature, it has the potential to significantly reduce overall transaction costs for REDD. Developing a global fund, however, faces a number of obstacles. In order for a REDD biodiversity fund to work properly, it must first possess a mechanism to differentiate those REDD projects offering biodiversity conservation from those projects that do not (i.e., those projects that receive the biodiversity conservation payment and those that do not). This can, for example, be achieved through a certification process similar to that carried out by the CDM executive board. This certification must evaluate the ecosystem that is proposed for protection under REDD and, accordingly, determine whether or not the project will deliver significant biodiversity benefits. We suggest considering two characteristics of the ecosystems proposed for inclusion under REDD when awarding biodiversity certification: (1) the level of biodiversity within the ecosystem and (2) the extent of ecosystem degradation. If the forest region meets or passes a pre-defined threshold for both criteria, then the project will receive certification and therefore qualify for financial support from the global fund.

Fixing the threshold value of biodiversity and degradation that would determine which projects would be eligible to receive the payment is a difficult task. Measuring biodiversity is no easy endeavour, nor is localizing which areas are most prone to deforestation (i.e. the leakage issue). Nevertheless, we can hope that sufficient expertise has already been acquired in addressing these issues, notably through certification projects such as the Climate, Community & Biodiversity Alliance (CCB) Standards (CCBA, 2005).[26] The main objective of whichever certification scheme is chosen will be to verify that the ecosystem services included (i.e. carbon sequestration and biodiversity conservation) are actually being delivered.

Another significant obstacle to developing a global fund that will provide payments for high biodiversity REDD projects is the source of funding. ODA has become an increasingly popular source of REDD funding and could contribute to a new IPES fund. A tax on biodiversity threatening activities is another option. However, acknowledging that taxation is often politically sensitive to the point of being excluded on principle, the authors seriously question the likelihood of such a 'biodiversity tax'. Instead, the authors suggest a combination of sources consisting mainly of private and public donations, similar in breadth to the range of investors financing the World Bank BioCarbon Fund.

Determining the appropriate level of payment is another concern. Finding the efficient payment level would theoretically require valuation of the non-marketed value of biodiversity conservation coming from the specific project, including an opportunity cost component to reflect importance of continued provision. This is a difficult undertaking at best (see Christie et al., 2006). Practically speaking, however, because the ultimate goal is to ensure that high-biodiversity REDD-generated offsets are more attractive to carbon investors than other offset options, the relative price of EROs should play a role in determining the level of the payment offered.

Overall, the idea of instituting an IPES fund through which various stakeholders could invest in the biodiversity component of REDD projects, although problematic, is compelling. As a centralised approach, such a system would need to ensure the provision of biodiversity benefits that can be extrapolated to a large category of general biodiversity beneficiaries and that the amount of the payment for biodiversity conservation is appropriate. A more decentralised approach, on the other hand, might be more appropriate for including those biodiversity beneficiaries that are mainly interested in the more site-specific ecosystem services of a REDD project. If properly instituted, such a decentralised approach is likely to be more efficient, cost-effective and politically feasible.

E. The decentralised 'partnerships' option

Under a more decentralised approach to bundling ecosystem services, specific actors demanding biodiversity conservation (or potentially any other ecosystem service present within a given REDD project site) would partner with carbon investors investing in reduced emissions in order to jointly invest in a specific REDD project. Unlike a general fund, partnerships would allow for the bundling of payments to happen on a case-by-case basis. Contingent on the elaboration of a sustainable, equitable and well-instituted system of providing 'bundles' of ecosystem services, beneficiaries would thus be allowed to negotiate an appropriate payment scheme for co-financing an agreed upon REDD project. This added flexibility would make the transactions more attractive by allowing beneficiaries to select those projects in which they are most keen to invest.

At a minimum, the partnership approach to REDD requires a platform through which biodiversity demanders and carbon investors can meet, exchange information and negotiate. The Ecosystem Marketplace[27] already provides a preliminary template for further developing these markets for ecosystem services. Such a forum would serve as a platform for attracting investments, negotiating deals, and disseminating any relevant information. Whereas the fund abides by a strict payment regardless of specific forest (as long as it is certified), partnerships allow for flexibility and bargaining. Different investors collaboratively and cost-effectively finance one conservation project that achieves both reduced emissions and biodiversity conservation, along with any other type of ecosystem service that might be of interest to other beneficiaries (e.g., a local bottling company interested in maintaining water quality through conservation).[28] The main advantage of having a more decentralised approach to financing REDD, therefore, is that it has the potential of tapping into multiple sources of funding by integrating a variety of stakeholders. These stakeholder extend beyond the specific beneficiaries of biodiversity to include also those parties which benefit from other ecosystem services delivered by conservation (e.g. water flow regulation, erosion control, cultural services, storm buffering, etc.).

Table 3 profiles some types of carbon and biodiversity investors which may partner under this cost-sharing arrangement. It must be noted that actors investing in carbon and biodiversity at the moment comprise two seriously limited groups. While the number of carbon investors and the magnitude of their investments, as described previously, are increasing substantially, biodiversity investors have yet to experience such growth. The limited supply of specific biodiversity beneficiaries and the correspondingly limited willingness to pay for biodiversity conservation undeniably represents a huge limitation to investment in REDD through the partnership approach. These limitations are a remnant of the public goods nature of biodiversity-related benefits and the lack of a hard international mandate for its conservation. Ultimately, the lack of incentives to invest in biodiversity conservation will have to be addressed on a large scale. In the mean time, establishing a mechanism for investment in biodiversity conservation such as this partnership approach – where the full burden of cost and implementation may be shared by more than one party – may provide a channel through which otherwise limited demand for biodiversity conservation may be realised.

Table 3. Some of the potential biodiversity and carbon investors in REDD under the partnership approach.

Biodiversity Investors	Carbon Investors
• Pharmaceutical Companies • Research Institutes • Non Profit Organisations • Ecotourism Companies • Water Utilities • International Organisations • Insurance Companies	• Offset Supplier (i.e., project developers, aggregators/ wholesalers, retailers and brokers)[29] • Governments • Multinational corporations • Large-scale events (i.e., concerts, conferences) • Financial institutions

While there are many ways to establish a platform through which these 'ecosystem investment partnerships' can be made, a virtual marketplace in the form of an internet website could perhaps be the most appropriate means of implementation. The idea of employing recently-developed communications tools (i.e. the world wide web) for the purpose of conservation could lead to the development of innovative financing mechanisms. Annex I offers a concrete example of how such a virtual forum could work for the further development of REDD within an IPES framework.

VII. Conclusion

This paper has shown that the benefits REDD offers in terms of biodiversity conservation have the potential to be real, large and globally diffuse. These benefits will only be ensured, however, if REDD is accompanied by some mechanism to formally internalise them within the market. As REDD becomes more commonly accepted as an ERO in both mandatory and voluntary markets, the biodiversity benefits which initially fostered its inclusion may disappear alongside the pursuit to secure the cheapest offsets. Using IPES as a framework through which payments for reduced emissions and biodiversity conservation can be bundled into one investment in REDD allows and perhaps even facilitates the market expansion of REDD, while at the same time integrating previously-overlooked biodiversity benefits.

The paper concluded by detailing two models for combining payments for reduced emissions and biodiversity conservation through REDD. The first scheme combines finances from general biodiversity beneficiaries with carbon investments in REDD through a centrally-managed fund. In contrast, the second matches payments from specific beneficiaries of conservation with investments in REDD through a decentralised system of 'partnerships.' Both schemes represent modifications to the carbon IPES framework that are specifically intended to create a mechanism by which the positive externality of biodiversity conservation (as a direct result of REDD projects implemented in high biodiversity locations) is captured in the market. Internalizing biodiversity benefits in this way will hopefully create further incentives (and funds) for biodiversity conservation within REDD.

A note of caution is advised when experimenting with potential approaches to REDD. By focusing exclusively on the potential for reduced emissions and biodiversity conservation, this paper has wholly ignored the impacts – both positive and negative – such an approach to REDD may have on indigenous communities. Any formal experimentation with REDD must be accompanied by a detailed analysis of the full range of implications for local livelihoods. We recommend this as the first frontier for follow-up research. Moreover, we highlight (1) indeterminate methods for measuring biodiversity values, (2) a lack of willingness to pay for biodiversity conservation and (3) an analysis on the impact of unclear property rights throughout rural areas of the developing world on the proper implementation of REDD, as additional obstacles preventing the functioning of these schemes in the real world. More generally, analysis is also required on the likely impacts of formally incorporating REDD into carbon markets, with or without biodiversity internalisation (World Bank, 2006).

The expansion of REDD faces a number of design flaws. Specifically, issues such as permanence, leakage and additionality are particularly difficult to overcome, and they will all have implications for biodiversity conservation (Schlamadinger et al., 2004). In a deliberate attempt to offer a forward-looking perspective on REDD, we have chosen to leave these important issues aside. Without neglecting the importance of addressing such fundamental challenges, we have focused more specifically on the opportunities that REDD might bring.

REDD provides a unique opportunity to address the need for increased collaboration between ‘climate’ and ‘conservation’ stakeholders. Specifically, REDD provides an opportunity for international policy to respond to calls to coordinate Multilateral Environmental Agreements [30]based on increasingly holistic views of ecosystem management (CBD, 2004). The bundling of payments for climate regulation and biodiversity conservation ecosystem services, as described in this paper, can help articulate the overlap between the CBD and UNFCCC so often recommended and commence the transition from single-criterion environmental policies toward more integrated approaches to environmental regulation (Cowie et al. 2007). With the potential to deliver both reduced emissions and biodiversity conservation, IPES provides an excellent framework for developing REDD and finally allowing forest conservation efforts to formally reflect the range of services they provide. Generally, this discussion illustrates the need for further research on methods of combining payments for reduced emissions and biodiversity conservation through REDD.

Acknowledgements

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Appendix 1: The opportunity costs of foregone income in eight tropical countries, based on a perceived goal of 50% reduction in deforestation.

Country	Range of opp. costs		Reduction in deforestation (x 1000 ha)	Costs (x 1000 US$)	Opportunity costs (US$/ha)
Cameroon	Min	Annual food crops long fallow	44	15,222	346
	Max	Cocoa with marketed fruit	66	90,062	1,365
DRC	Min	Annual food crops with long fallow	64	22,071	346
	Max	Cocoa with marketed fruit	96	130,589	1,365
Ghana		Small scale maize and cassava	115	121,008	1,052
Bolivia	Min	Beef cattle	189	73,645	390
	Max	Soya	81	172,895	2,135
Brazil	Min	Beef cattle small scale	217	528	2
	Max	Tree plantations	31	81,109	2,614
PNG	Min	Smallholder oil palm	23	35,065	1,515
	Max	Oilpalm estates	46	125,211	2,705
Indonesia	Min	Cassava monoculture	355	6,476	18
	Max	Large scale oil palm	380	1,027,205	2,705
Malaysia	Min	Rice fallow	28	731	26
	Max	Oilpalm large scale/government	25	68,556	2,705

Source: Grieg-Gran, 2006

Appendix 2: The IPES virtual marketplace

The idea of using a virtual web-based platform to match investors in different ecosystem services so that they can jointly finance one project delivering multiple goods, could be devised in a number of ways; we chose to highlight just one option.

One way for a website to facilitate the creation of ‘ecosystem investment partnerships’ is to differentiate between investments by ‘project developers’ and ‘project compensators’ and provide the necessary means for these two groups to communicate and, eventually, jointly invest in a project. Project developers are those actors designing and implementing a carbon or conservation project who are seeking a small, additional source of financing to supplement their overall costs. Project compensators are those actors interested in investing in either carbon or conservation, but do not want the full burden of project implementation and monitoring. Once matched, project compensators would offer a compensatory payment to project developers investing in projects which deliver – as an ancillary benefit – the specific environmental service they are seeking. As a starting point, this website would include postings for ‘biodiversity project developers’, ‘biodiversity project compensators’, ‘carbon project developers’ and ‘carbon project compensators’ (Figure 6). The goal of the website would therefore be to match biodiversity project developers with carbon project compensators and carbon project developers with biodiversity project compensators.

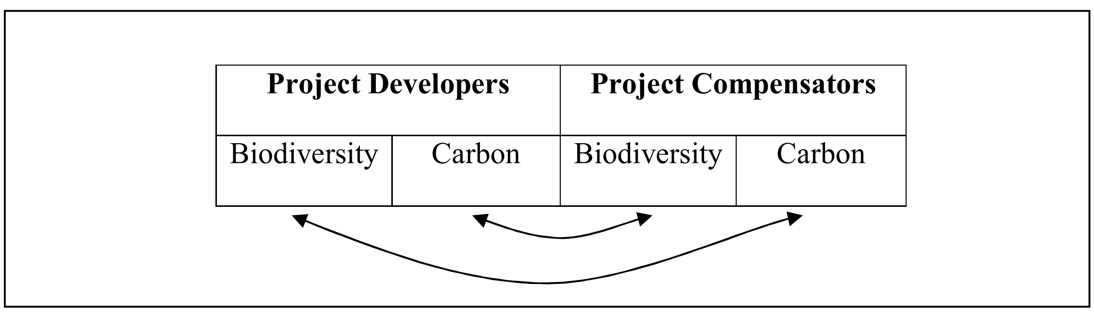

Figure 6. Matching investments in different ecosystem services through a website.

A hypothetical example is helpful for conceptualizing the partnership arrangement. A non-profit organisation, Save the Giant Jumping Rat (a biodiversity project developer), is raising money to protect the habitat of an endangered species, the giant jumping rat, which lives in the tropical forests of Madagascar. They have raised a substantial amount of money, but not quite enough to cover the full cost of their project. In pursuit of more funding, Save the Giant Jumping Rat advertises their project on this ecosystem investment partnership website along with the specific amount of compensation they are seeking. An offset provider, ClimateFirst, is trying to decide their next project. They are interested in investing in REDD, but don’t want the full burden of project implementation (they are therefore a carbon project compensator). A project manager at ClimateFirst browses this website to see if his business might be able to collaborate with a conservation organisation that already has a specific project in mind. He sees the ad posted by Save the Giant Jumping Rat and notices that the size of the project and compensation requested is an amount close to what his business is looking to invest. He checks out the project information and gets in contact with the organisation. After negotiation and the creation of a contract, the two groups jointly invest in this conservation project, thereby providing biodiversity conservation and reduced emissions at an overall lower cost (Figure 7).

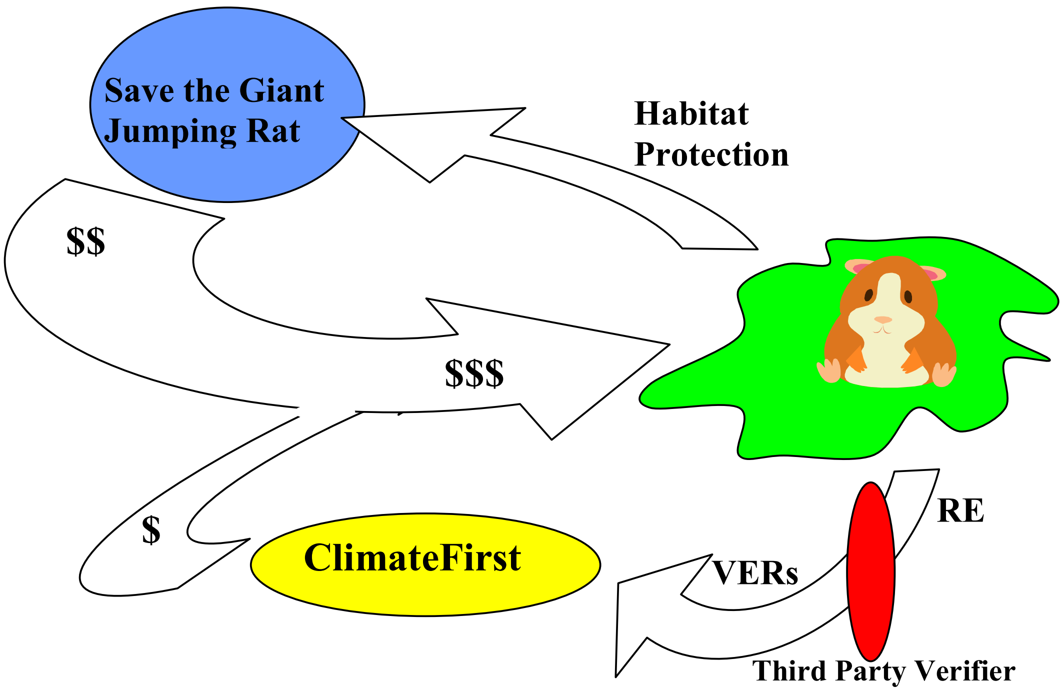

Figure 7. A hypothetical example of joint investment in REDD through the partnership approach.

This is an overly-simplified version of a quite elaborate process, the details of which will obviously have to be pain-stakingly finalised. A more specific outline of the steps a project developer – such as Save the Giant Jumping Rat – would go through in order to secure financing from a project compensator – such as ClimateFirst – is represented in Figure 8. This figure is intended to convey the basic process that participation in the virtual marketplace for ecosystem services could entail. By outlining the potential process and providing hypothetical example, we hope to give some basic substance to an otherwise purely abstract idea.

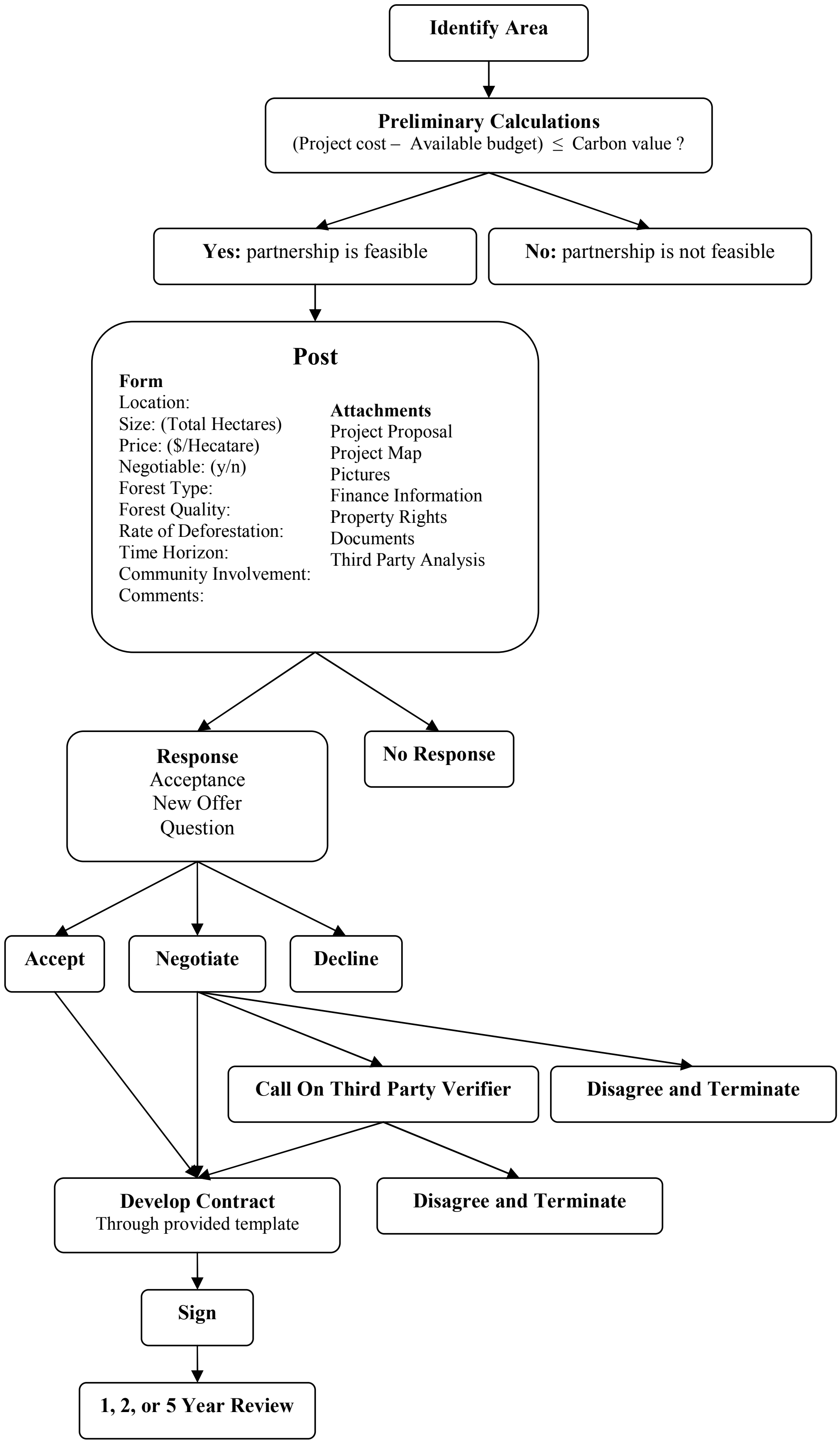

Figure 8. Potential steps for establishing ecosystem investment partnerships through a virtual marketplace.

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Endnotes

[1] Ecosystem services can be defined as the many natural processes by which ecosystems, and the species that make them up, sustain and fulfil human life (Daily, G., 1997). Under a more current definition, ecosystem services are defined simply as the benefits people obtain from ecosystems. These benefits include provisioning services such as food, water, timber, and fiber; regulating services that affect climate, floods, disease, wastes, and water quality; cultural services that provide recreational, aesthetic, and spiritual benefits; and supporting services such as soil formation, photosynthesis, and nutrient cycling (MA, 2005).

[2] Afforestation is defined under the CDM as replanting trees in areas that have been without forest for at least 50 years, while reforestation is defined as replanting trees in areas that have been without forest since at least 31 December 1989 (Pearson et al., 2006).

[3] The Regional Greenhouse Gas Initiative (RGGI) in the United States and New South Whales Greenhouse Gas Abatement Strategy (GGAS) in Australia are two examples.

[4] The global potential of wetlands to sequester carbon is also substantial, but widely overlooked (Pant et al., 2003).

[5] REDD is sometimes referred to as "Reduced Emissions from Deforestation and forest Degradation" or "Reduced Emissions from Deforestation and ecosystem Degradation". In this paper, the authors simply use "Reduced Emissions from Deforestation and Degradation" in order to stay consistent with existing terminology without neglecting the fact that the protection of more ecosystems than just forest can provide reduced emissions.

[6] See the discussion of public goods by Head (1962).

[7] REDD is often used interchangeably with avoided deforestation. This paper assumes avoided deforestation as a broader category of which REDD is a part. Avoided deforestation is an environmental management instrument used to achieve a number of goals, while REDD is a form of avoided deforestation and avoided forest degradation intended to specifically reduce GHG emissions.

[8] Defined as "activities in agriculture and forestry that reduce emissions, or increase removals of greenhouse gases" (IPCC, 2000).

[9] Carbon conservation preserves the benefits of carbon sequestration by keeping carbon sequestered instead of released back into the atmosphere. In this sense, REDD allows the benefits of carbon sequestration to continue to be delivered.

[10] The issue was first abbreviated as RED (reduced emissions from deforestation) by the governments of Papua New Guinea and Costa Rica in their proposal for including emissions from avoided deforestation in some sort of compensation scheme under the UNFCCC (UNFCCC, 2005). The concept later grew to include forest degradation, and assumed the new abbreviation, REDD, by the Coalition of Rainforest Nations (UNFCCC, 2006). Currently, either abbreviation may be used depending on whether or not forest degradation is considered a source of emissions.

[11] One of the first projects designed specifically to reduce GHG emissions through reduced deforestation was the Noel Kempff Climate Action Project, initiated in 1997. This project will be more thoroughly discussed later in the paper.

[12] The current carbon market was established as a result of GHG emission reductions mandated in Annex I countries[12] under the Kyoto Protocol. In addition to reducing emissions directly, Annex I countries can meet their GHG limitations by either purchasing GHG emission reductions from non-Annex I countries under the Clean Development Mechanism (CDM) or from Annex I transitional economies under Joint Implementation (JI). Reductions sold under these flexibility mechanisms – certified emissions reductions (CERs) – are bought on a project basis and certified by the Executive Board of the CDM or JI. While JI primarily generates offsets through emission reductions from the energy sector, the CDM allows the generation of offsets through emission reductions from carbon sequestration.

[13] The CCX is a voluntary marketplace which establishes legally binding emissions reductions commitments achieved through emissions trading and offsets.

[14] Personal correspondence with Joerg Seifert-Granzin, 18 June 2007.

[15] Nabuurs, G-J., 2007. Personnel communication.

[16] See www.ecosystemmarketplace.com.

[17] Currently there are no proposals for including credits generated through REDD under the UNFCCC certified carbon markets on a project basis. For a review of nationally-based approaches to REDD, see Deutsche (2007).

[18] See Skutsch (2007) for a review of both proposals.

[19] This proposal was initially presented by researchers associated with the Instituto de Pesquisa Ambiental da Amazonia (IPAM) at a COP9 side event (see Santilli et al., 2003).

[20] According to the "once in, always in" clause, a country credited after the first commitment period must agree to stabilizing or further reducing deforestation emissions in subsequent periods. Those countries with historically low deforestation rates may negotiate a baseline above historic deforestation levels, allowing for a "growth cap" (Santilli et al., 2003).

[21] This proposal was initially presented by the Institute for Environment and Sustainability for the European Commission Joint Research Centre at COP11 (see Achard et al., 2005).

[22] The JRC also specifies three types of forest cover: intact forest, non-intact forest and non-forest. This categorization allows both deforestation and forest degradation to be measured. Carbon levels for intact forests would be determined on an ecosystem basis according to the literature, while carbon levels for non-intact forests would be valued at half of that of the intact forest. Instead of forcing countries to maintain or reduce deforestation levels in subsequent commitment periods through the use of CERs, JRC awards carbon credits through temporary certified emission reductions (tCERs). This method offers national flexibility by assigning liability for reverted deforestation rates to the buyer (Achard et al., 2005).

[23] Some say the recent embrace by mainstream business has pushed voluntary carbon market to a "tipping point" (Brand and Meizlish, 2006). They point to the countless surveys that have reinforced the fact that carbon is on the agenda of corporate boards and that reducing and offsetting emissions are a top priority (see Taiyab, 2006; BSR and Katoomba Group, 2006).

[24] See Sim et al. (2004) for a detailed review of the benefits biodiversity brings to local communities.

[25] Bioprospecting agreements are an example in which specific beneficiaries of biodiversity conservation pay for its provision through protected areas.

[26] For more info, see http://www.climate-standards.org/ .

[27] For more information, see www.ecosystemmarketplace.org

[28] The generation of a free contract template addressing cost-sharing and risk-sharing, similar to the recently released CER sale and purchase agreement (CERSPA), may help facilitate negotiations. The CERSPA was generated by 30 lawyers and CDM experts from around the world, representing the private sector, civil society, intergovernmental organisations and financial institutions. It provides a simple, balanced, open-source CDM contract that is accessible to sellers and buyers in many countries (see www.cerspa.org).

[29] Offset suppliers consist of project developers, aggregators/wholesalers, retailers and brokers. Project developers develop greenhouse gas offset projects and may sell carbon to aggregators, retailers, or final customers. Aggregators/Wholesalers only sell offsets in bulk (defined as more than 25 tCO2e) and have ownership of a portfolio of credits. Retailers sell small amounts of credits to individuals or organisations, usually online, and have ownership of a portfolio of credits. In some cases VERs also pass through brokers, who do not own credits, but facilitate transactions between sellers and buyers (Hamilton et al., 2007).