

## Research Article

# REDD+, Adaptation, and sustainable forest management: toward effective polycentric global forest governance<sup>1</sup>

Andrew Long<sup>1</sup>

<sup>1</sup>Florida Coastal School of Law, Jacksonville, FL, USA; Email: along@fcsf.edu

### Abstract

The Reduced Emissions from Deforestation and Degradation (REDD+) program emerging as a part of the international climate change regime holds the potential to dramatically affect forestry in the tropics. REDD+ has demonstrated an ability to overcome the major political obstacles to earlier efforts to promote sustainable forest management (SFM) in the tropics, but key questions regarding its on-the-ground impact remain. This article suggests that REDD+ can become a successful vehicle for advancing SFM if it is re-conceived to include support for adaptation as one of its primary goals. Some degree of adaptation is necessary to effectively implement any form of REDD+, and SFM practices offer the core toolkit for securing forest adaptation in the context of REDD+. Re-envisioning REDD+ as a dual-focus program aimed at mitigation and adaptation builds upon the potential synergies between these two climate regime goals and calls upon experiences with SFM to provide the means of achieving them. Operationalizing this vision will require development of novel arrangements of authority and incentives across scales of governance that can provide opportunities for learning in support of a larger need for new approaches to governance of global environmental issues. Thus, integrating adaptation into REDD+ can advance not only climate change regime goals, but also long-standing SFM goals and the increasingly apparent demand for more effective international environmental governance generally.

**Keywords.** REDD+, adaptation, sustainable forest management, climate change, polycentric governance.

Received: 11 July 2011; Accepted: 29 November 2012; Published: 19 August 2013.

**Copyright:** © Andrew Long. This is an open access paper. We use the Creative Commons Attribution 3.0 license <http://creativecommons.org/licenses/by/3.0/> - The license permits any user to download, print out, extract, archive, and distribute the article, so long as appropriate credit is given to the authors and source of the work. The license ensures that the published article will be as widely available as possible and that the article can be included in any scientific archive. Open Access authors retain the copyrights of their papers. Open access is a property of individual works, not necessarily journals or publishers.

**Cite this paper as:** Long, A. 2013. REDD+, Adaptation, and sustainable forest management: toward effective polycentric global forest governance. *Tropical Conservation Science*. Special Issue Vol. 6(3):384-408. Available online: [www.tropicalconservationscience.org](http://www.tropicalconservationscience.org)

<sup>1</sup> This Article was prepared in connection with the 15th Annual Conference of the International Society of Tropical Foresters (Yale Student Chapter), held at the Yale School of Forestry & Environmental Studies in New Haven, CT on February 13, 2010.

## Introduction

A program for reducing emissions from deforestation and degradation (known as “REDD” or “REDD+”) is emerging from negotiations under the UN Framework Convention on Climate Change (UNFCCC) and through a range of pilot programs supported by international institutions such as the World Bank, nongovernmental organizations (NGOs), and certain developed countries. Tropical forest developing countries are amending national laws to prepare for REDD+, while developed countries now provide significant financial resources to support REDD+ development and are exploring how recognition of this support should be embedded in national laws. Thus, some form of REDD+ is likely to play a significant role in international efforts to combat climate change [1, 2].

A number of commentators, including myself, have suggested that REDD+ may be important to developing new and more effective governance systems for globally significant natural resources [1, 2, 3]. Indeed, REDD+ is already giving rise to innovative and collaborative governance arrangements. For example, the Governors’ Climate and Forests Task Force (GCF) is a unique arrangement of 17 states and provinces in six countries that seeks to develop rules and readiness for REDD+ [4]. REDD+ can thus be seen as a particularly important proving ground for new forms of global natural resource governance because it will require multiple nodes of authority, ranging from subnational to international.

Despite the relatively rapid development of REDD+ in some areas, significant disagreements remain on a range of issues integral to the successful operation of a global forest-carbon program. Levels of support for REDD+ range from eager endorsement by some governments and international environmental NGOs to fierce opposition by some segments of civil society [2]. There are several reasons for this disparity, which include differing assessments of technical feasibility to deep philosophical disagreements about the value of incentive-based regulation. For the communities that will be directly impacted by REDD+, however, there is perhaps no more important issue than understanding and shaping the broad environmental and socio-economic effects of bringing REDD+ into their forests. These include the potential for REDD+ to enhance or degrade non-carbon environmental services and a similar potential to affect the economic condition and legal rights of communities that depend upon forest resources. Although these concerns have gained recognition through the work of environmentalists and indigenous peoples’ representatives, among others, much REDD+ literature continues to view them as secondary in importance to the ability to secure carbon in trees. Recent decisions of the UNFCCC Conference of the Parties suggest a similar view by addressing these concerns merely as “safeguards” in a system designed primarily to maximize carbon storage [5]. However, environmental and development concerns beyond carbon storage will be integral factors in determining whether REDD+ succeeds.

In this article, I suggest that non-carbon environmental and social impacts should become central to REDD+ development across all levels and types of governance because of their relevance to climate change adaptation, and because of the potential for adaptation-oriented activities that are built into REDD+ to strengthen acceptance and permanence of REDD+ mitigation benefits while also increasing the sustainability of tropical forestry. In other words, designing REDD+ to promote incorporation of adaptation-related measures offers a means of enhancing the program’s long-term success, beneficial impact, and equitable implementation. This approach may enable REDD+ to become a significant force to improve global forest governance, but requires development of new incentives and a careful arrangement of authority across scales of governance that is sensitive to both the global nature of carbon storage benefits and the local nature of adaptation benefits.

Of great relevance to broader international forest policy, incorporation of adaptation considerations into REDD+ will significantly enhance the possibility for REDD+ to serve as an effective vehicle to achieve many

of the long-standing (and frequently unsatisfied) priorities of sustainable forest management (SFM) efforts. REDD+ appears poised to overcome key political hurdles that have thwarted earlier efforts to improve tropical forest management through global governance, but its ultimate contribution to achieving SFM will depend upon the range of environmental and social values served by the program. This article suggests that a significant conceptual and practical unity exists between emerging REDD+ efforts and pre-existing (and often frustrating) dialogue on SFM in tropical forests, and that beneficial synergies between the two approaches can be maximized by concentrating on adaptation-oriented activities in development of REDD+. Thus, an adaptation-oriented approach to REDD+ can facilitate drawing on REDD+'s momentum to expand SFM while simultaneously enhancing REDD+'s overall social and environmental value (including carbon storage value) by incorporating the expertise of and lessons learned by the SFM community. As suggested above, however, achieving such a result in practice requires more than political success. It demands the creation of an intentionally multi-layer governance program with incentive systems to influence national and subnational actors toward achieving mitigation and adaptation benefits through a form of REDD+ that emphasizes SFM.

### **Situating REDD+ in the Forests: Beyond Deadlock in Forest Politics**

Across the broad spectrum of international environmental law, there is no more striking example of negotiation failure than efforts to halt deforestation and promote sustainable forest management (SFM) in tropical forests.<sup>2</sup> Efforts toward SFM seek to ensure that forest use maintains biodiversity and ecosystem function over time, meeting the needs of current and future generations. It encompasses not only specific forestry practices (see Griscom and Cortez, this collection), but also the legal and institutional arrangements under which they are carried out.

In the early 1990s, there was a push to establish an international legal framework to support SFM at a global level and the spectacular failure of this effort has set the stage for all subsequent approaches to promoting SFM in the tropics. In the lead-up to the United Nations Conference on the Environment and Development (UNCED) in 1992 – arguably the single most important event in an era of top-down international environmental lawmaking – three broad issue areas dominated international attention: climate change; biodiversity loss; and tropical deforestation. The outcome of UNCED for climate change, the United Nations Framework Convention on Climate Change (UNFCCC), quickly grew into one of the most developed regimes in all of international environmental law [9]. UNCED also produced one of the most important international legal agreements for biodiversity preservation, the Convention on Biological Diversity (CBD).<sup>3</sup> In contrast to the relative success of negotiations and subsequent regime development on these issues, the question remains open 20 years after UNCED whether an international regime to address deforestation even exists [9].

Negotiations toward preserving tropical forests broke down before the UNCED formally convened and the conference produced only a non-legally binding (and almost irrelevant) statement of forest principles [8]. As other scholars have noted, the 1992 Forest Principles “represented a politics of the lowest common

---

<sup>2</sup> Efforts to reduce tropical deforestation through formal international law development can be viewed as a case study of negotiation failure and perverse normative motivation [6].

<sup>3</sup> Despite the lack of a substantive mandate to conserve biodiversity in CBD, the convention nonetheless represents a successful outcome of efforts to develop a legal infrastructure for global biodiversity protection. Among other things, CBD has evolved into an overarching framework convention and source of coordination on biodiversity regulation that advances scientific understanding of biodiversity-related matters and policy knowledge relevant to eventually developing a comprehensive and effective multilateral conservation program [7, 9].

denominator” [11, pg. 437] and “reflect the absence of international consensus on the subject.” [9 pg. 540, 6].

The state of international forestry law has not significantly improved in the last two decades.<sup>4</sup> The eight rounds of international negotiations during 1992-2000 under the auspices of the International Panel on Forests (IPF) and International Forum on Forests (IFF) were characterized by “virtually complete stagnation” [6 pg. 8]. By 2000, most international environmental NGOs had given up hope for meaningful a global forests convention and began to oppose the creation of such an instrument due to fears that any resulting treaty that would simply legitimize the status quo, among other reasons [6]. The outcome of negotiations during the 1990s was the creation of the UN Forum on Forests, which became the primary UN body for advancing international forest policy in 2000.

At the first meeting of UNFF, “countries agreed to disagree on all substantive policy matters . . . [and] cooperated in eviscerating the new institution.” [6, pg. 10]. UNFF negotiations have consistently disappointed advocates of greater forest protection and failed to produce instruments or activities that significantly reduce the rate of tropical deforestation or effectively spread SFM in the developing world. In 2005, for example, the European Union and others approached UNFF-5 as an opportunity for significant progress in developing legal tools to advance SFM, but the negotiations broke down and nothing was produced – even a political agreement as weak as the 1992 Forest Principles seemed out of reach [12]. A statement of principles agreed to by UNFF in 2007, which does little more than the 1992 Principles to advance SFM, is perhaps the most important product of the institution to date.

In sum, the global forestry institutions of the past twenty years may be, in the words of one sharply critical commentator, “hollow institution[s] deliberately designed to be idle” [6, pg. 4]. The reasons underlying the failure to create significant international forest law, and for the “grotesque” nature of the institutions [6 pg. 10] that instead occupy that policy space, are a complex mix of global politics, contested visions of the forests, and concrete challenges that underlie tropical deforestation itself.

While it is possible to argue that the myriad international instruments and institutions affecting forests create an international forest regime [10], the current state of international forest law undoubtedly falls far short of an *effective* regime. Moreover, the last 20 years of forestry negotiations have killed nearly all hope for a meaningful overarching multilateral environmental agreement (MEA), like the MEAs that exist for nearly all other areas of international environmental concern, in the near future. With the death of hope for a forest MEA, forest protection advocates turned their attention elsewhere.

For some time, the innovative private governance model of forest certification, created through the Forest Stewardship Council in the wake of UNCED, held out hope for reversing the large-scale destruction of tropical forests. But the FSC model has not succeeded in significantly reducing tropical deforestation, and major obstacles severely limit its likelihood of doing so in the future [13, 14, 15, 1].

Most recently, hope for saving the remnants of tropical forests has begun to coalesce, although somewhat uneasily, around the REDD+ program emerging from the climate change regime as a possible last chance to preserve intact tropical forests on a large scale [16]. Among other reasons, REDD+ creates hope for greater forest protection because its design appears to overcome the core political disagreements that thwarted efforts to negotiate an MEA for forests.

---

<sup>4</sup> For a thorough treatment of international forest negotiations during the 1990s and 2000s, see Humphreys, Logjam [10].

## **A. REDD+ and Political Hurdles**

Basic political considerations provide an important piece of the explanation for the failure international forest negotiations over the last two decades. One can view international forest negotiations of the early 1990s as a “price negotiation” in which a broad array of developing country economic concerns would have to be addressed before tropical forest developing countries would agree to international commitments protecting forests within their territories [11]. Stated differently, the failure of these negotiations can be partially explained by the refusal of tropical forest developing countries to restrict their sovereign prerogative to control forest resource use within their territories unless they received direct and significant financial compensation in exchange, and the refusal of developed countries to enter any agreement that would bind them to the level of financing necessary to bring developing countries to the table.

Notably, the positions adopted during these negotiations, which were grounded primarily in countries’ domestic economic and political circumstances, align with fundamentally important principles of international environmental law: states’ sovereign control of resources within their territory and common but differentiated responsibilities. The importance of these two principles in international environmental law helps to explain why forestry negotiations failed so spectacularly and why that failure has not been overcome. Beyond explaining past failures, these two principles also provide insight into why REDD+ has a much greater chance of political success than direct negotiations toward a forestry convention and can provide a framework for assessing the considerations that will determine the overall success of REDD+ in preserving tropical forests.

### **1. Sovereignty Over Natural Resources**

A nation’s sovereign right to control the natural resources within its territory is perhaps the most firmly entrenched international law principle that shapes international environmental law. It aligns with the core role of territorial sovereignty in the Westphalian conception of the state that forms the bedrock of traditional understandings of international law generally.

Sovereign control over natural resources played a direct role in both forest and climate change negotiations, and serves as a useful backdrop for contextualizing the development of REDD+. The principle is expressed in Principle 2 of the Rio Declaration on Environment and Development (which largely restates Principle 21 of the 1972 Stockholm Declaration) as a basis for the obligation to avoid transboundary harm [17, 18]. The principle against transboundary harm “remains the cornerstone of international environmental law” nearly forty years after its initial adoption [9, pg. 236], but it rests upon the even more firmly entrenched principle of each nation’s sovereign control over its natural resources. It is because of sovereign authority over resources that nations are obliged not to damage the resources within another nation’s territory.

The emphasis on national control of resources was specifically applied to forests in the 1992 Forest Principles [8], and the 2007 UNFF agreement on forest principles [19], as well as virtually every other international agreement affecting forests. The direct application of the principle to forests stands in contrast to the efforts of forest protection advocates to achieve international recognition of forests as either the common heritage or common concern of humankind in the 1980s and 1990s, [9, 20, 11], and

helps to explain the failure of such efforts. Moreover, the principle of sovereign control over forest resources can be used to explain the movement of forest protection efforts away from a top-down convention-based model toward a more contract-based model of regulation, as seen in forest certification efforts and REDD+.

The overriding lesson that emerges from the emphasis on national sovereign control of forests during UNCED and subsequent negotiations is that developing countries can use their sovereign control of the resource to demand financial payment in exchange for restrictions on tropical forest exploitation [9, 6, 11]. The demand for financial compensation not only reflects a perceived need to offset the opportunity cost of preserving forests in developing countries, but also reflects a real need to establish or secure adequate governance capacity (including enforcement capability) to implement forest protection measures. In this sense, the “price negotiation” that has stalled development of international forest law reflects another principle of international environmental law, one that has had a steadily growing impact on the shape of international environmental law since its solidification at UNCED – the principle of “common but differentiated responsibilities.”

## **2. Common but Differentiated Responsibilities**

Payments to secure protection of tropical forests can be seen as an application of the principle of “common but differentiated responsibilities” (CBDR), expressed in Principle 7 of the Rio Declaration [17]. A core element of CBDR is the recognition that developed countries are better positioned to take the lead in resolving global environmental problems and should assist developing countries in meeting common goals.

CBDR has been embedded in nearly all multilateral environmental agreements of the past two decades. CBDR is expressed in Article 3.1 of the UNFCCC, for example. It is explicitly recognized in Article 10 of the Kyoto Protocol and, more importantly, permeates the entire structure of the agreement through differentiation of developed and developing country obligations to mitigate climate change. (21, 22). In forestry negotiations, the principle of common but differentiated responsibilities lends weight to the argument that developing countries should not bear a disproportionate share of the burden of conserving tropical forests and, therefore, should not be compelled to act absent adequate financial and/or technical support from developed countries.

Some major developed countries, such as the United States, have repeatedly demonstrated a clear refusal to fund tropical forest protection on the scale needed to overcome developing country sovereignty concerns [6]. In part, this may be because the interests of developed countries in regard to tropical forests are mixed. Civil society environmental interests in these countries favor tropical forest protection, but concrete economic interests in at least some of these same countries benefit from the continued exploitation of tropical forest resources and the availability of relatively cheap agricultural land that results from forest clearing. Thus, funding tropical forest preservation for its own sake presents, at best, a challenging domestic political issue in several important developed countries. General recognition of CBDR, in forestry and elsewhere, simply has not proven strong enough to change this political calculus. Instead, it strengthens the arguments of developing countries that refuse to accept international forest regulation without a firm commitment of financial support.

### **A. REDD+ & International Forest Politics**

Since its endorsement by the Conference of the Parties to the UNFCCC in the 2007 Bali Roadmap, if not earlier, REDD+ has provided hope of overcoming obstacles that have stymied prior efforts to reduce tropical deforestation and encourage sustainable forest management. The core impetus behind REDD+

in the climate regime lies in its potential to significantly reduce the roughly 17% of global greenhouse gas emissions attributable to the forestry sector [23].

The basic rationale for REDD+ is seductively simple: the costs of preventing emissions by reducing deforestation are projected to be significantly less than the cost of reducing emissions in many sectors within developed countries and, thus, anti-deforestation measures are seen as among the most cost-effective mitigation options in the near term [24]. From the perspective of international forest law, the attractiveness of REDD+ lies largely in its potential for overcoming the political deadlock of past forestry negotiations by securing massive funding from developed countries to preserve tropical forests in developing countries. In other words, REDD+ represents the possibility of creating concrete forestry improvements that align with CBDR, sovereign control of resources, and domestic political demands of all parties.

The voluntary nature of REDD+ for developing countries, as well as the importance of mitigating climate change for developed and developing countries alike, appear likely to provide sufficient leverage to overcome the sovereignty and finance concerns that once seemed an almost insurmountable barrier to tropical forest protection. Countries that once staunchly espoused sovereignty as a reason to oppose a global forests convention now embrace REDD+. Brazil, although historically wary of attempts to control its forest policy, now has the most developed legal infrastructure for REDD+ of any developing country [7]. Other tropical forest developing countries are working to catch up, and many appear eager to capitalize on the potential for REDD+ benefits.

The distinction between direct developed country payments for forest conservation and payments for carbon credits (or an equivalent recognition of emissions reduction) from reduced deforestation is politically important in developed countries with domestic constituencies that are concerned about climate change. A developed country that finances tropical forest preservation per se exposes a temporal and spatial disconnect between the cost and the benefit of the investment – developed countries will pay now for benefits that accrue most directly to developing countries and in the future. Although developed countries benefit from biodiversity preservation and other large-scale ecosystem services resulting from tropical forest preservation, these benefits have not proven to be politically saleable in most instances. Sponsorship of REDD+ activities that produces carbon credits (or equivalent recognition of mitigation action) for the sponsor, on the other hand, can be understood as providing a direct benefit to the sponsor (whether it be a developed country or a private party therein) to the extent that it allows avoidance of more costly emissions reductions. Unlike the remote and diffuse benefits of global forest preservation, cost savings that result from paying for emissions reductions abroad rather than reducing emissions at home is easily understood through “common sense” and familiar economic analysis, such as cost-benefit analysis. Accordingly, it is more likely to have political salience in developed countries and be seen as in the country’s self-interest. The power of this explanation is apparent in the early investment that many developed country corporations have made in forest carbon projects throughout the tropics (see examples in [25]).

This perspective on REDD+ shows why it seems, at least to many observers, to offer much greater hope for preserving tropical forests than many other global forest protection efforts of the last 20 years. REDD+ provides a way of re-shaping global forestry issues to avoid the political deadlock that killed efforts toward a global forest convention. It is voluntary (which avoids sovereignty concerns), involves developed country assistance to support developing country commitments (which reflects CBDR and conveys tangible benefits to developing countries), and provides direct verifiable benefits to investors who fund forest protection measures (which negates many domestic political hurdles in developed countries).

REDD+'s broad appeal to overcome global political hurdles to forest protection is rather straightforward, but negotiations toward operationalizing the concept quickly became complex. Questions over baseline rates of deforestation, leakage, permanence of emissions reductions, and other mitigation-related considerations form one line of that complexity. At the same time, another line of complexity arose as environmental groups and advocates for peoples living in and around tropical forests demanded increased attention to the broader social and environmental impacts that a global REDD+ program would create. For these reasons, the value that REDD+ presents for achieving global agreement on forests cannot be measured only by its ability to overcome political roadblocks. Instead, the promise of REDD+ suggested by its political appeal must be challenged in terms of its application and implementation on-the-ground in tropical forests.

Political considerations are not the primary reason for continued deforestation and are not the only reason that international negotiations to address the problem have failed. The forces driving tropical deforestation have proven particularly tenacious and, in much of the tropics, nearly immune to a variety of protection efforts outside of public international law (such as forest certification). The forces driving extensive deforestation in tropical countries are complex and, at a global level, heterogeneous. In many cases, these drivers penetrate deeply into the social, political, and economic systems surrounding forest management, making sustainable forestry an extremely complex endeavor. The simplistic political appeal of REDD+ as low-cost emissions reduction will not, on its own, overcome these challenges.

## **B. REDD+ and Deforestation Drivers**

Tropical deforestation persists because of both global and local forces, including international demand for agricultural land and timber, poverty and subsistence needs of peoples near forests, and poor governance [26, 27, 28]. While some of these drivers may be affected by direct regulation at the international level, changing others will require measures with extensive impacts at the national and/or subnational levels. For example, deforestation attributable to a relatively small number of multinational corporations may prove amenable to state-based and non-state-based international regulation because corporate actors generally respond to consumer pressure or requirements imposed by international environmental regimes [63]. By contrast, entrenched indirect drivers of deforestation – such as poverty or inadequate governance capacity – pose a profound difficulty for efforts to improve forest management through international regulation, including the REDD+ program. These indirect drivers suggest the need for an approach that is not simply international, in the traditional sense of agreements between states, but also polycentric in its distribution of governance authority because addressing them requires context-specific reforms that will depend on sufficient local buy-in to facilitate significant economic or political changes. Design of an effective global forestry program will require attention not only to international and national rules, but also to the relationships and incentives among a complex matrix of governmental authorities across all scales [29]. REDD+ will significantly increase SFM in the tropics only if it creates a sufficiently strong incentive for those with direct authority over the forests to implement SFM despite forces driving deforestation and, in many instances, also facilitates development of sufficient national capacity to secure SFM.

Although REDD+ implementation holds potential to catalyze broad environmental and social benefits, widespread concern exists regarding the impact of an expanded REDD+ program on environmental concerns such as biodiversity loss and social goals, especially with regard to indigenous peoples. To be effective, forest protection efforts must find ways to address the needs underlying deforestation, often referred to as the indirect drivers of deforestation. This challenge is likely to prove far more daunting than overcoming political obstacles to an agreement on a global forests program. It will involve addressing



governance failures at the national and subnational level, for example.<sup>5</sup> Some of these challenges may be well beyond the capacity of an international climate forest program to address, such as the corruption, war, and dictatorial national regimes that have plagued several significant forest regions in Africa [31, 32]. Another seemingly intractable deforestation driver is poverty, which presents one of the most difficult and important challenges for forest protection efforts. In many regions, subsistence needs drive deforestation because they underlie forest clearing for agricultural land or timber removal for fuelwood. Even where poverty does not directly cause subsistence-driven deforestation, economic needs and the enticement of funds from multinational corporations frequently underlie large-scale forest clearing to support palm oil plantations, cattle ranching, and other activities that produce agricultural goods for the global market [32].

In these contexts, questions about REDD+'s broader environmental and social impacts within developing countries are at least as important as its mitigation value. The most vocal opponents of REDD+ emphasize its potential to facilitate abuse of local communities and environments, pointing to some questionable practices associated with existing forest-carbon projects [33]. For example, in the relatively developed and stable nation of Brazil, a branch of the Brazilian military known as the *Força Verde* ("Green Police") enforces restrictions imposed by some forest carbon projects (such as the Guaraqueçaba Climate Action Project ) in a manner that allegedly excludes traditional forest users, including sustainable use by indigenous peoples [33, 34, 25, 7, but see 40]. The potential for abuse is presumably much higher in places where rule of law and economic development is less secure than in Brazil.

The concerns of many advocates for indigenous peoples further illustrate this point. In most instances, indigenous peoples could benefit from REDD+, but also face significant risks from its implementation [7]. Some organizations working on behalf of indigenous peoples oppose REDD+ as currently designed because they perceive it as a threat to their land claims and rights to access the forests [35, 11]. For indigenous peoples, concerns exist that REDD+ will foster exclusion from forests, restrictions on traditional forest uses, and inequitable resource allocation by national governments at the expense of local populations [36]. Similar problems may affect non-indigenous peoples dependent on forest use for their livelihood. For example, one recent article suggests that insecure tenure rights and poor accountability mechanisms in Ghana will pose major obstacles to effective REDD+ implementation in that country, posing an acute risk that REDD+ benefits will reinforce existing inequities [37].

The risk of negative externalities from REDD+ exists not only at the local or national scale, as discussed above, but also at the global scale. Biodiversity preservation presents a potent example. Without attention to biodiversity priorities in targeting REDD+ finance, modeling suggests that pressure for cost-effective carbon credits will limit the benefits for global biodiversity preservation by prioritizing funds to forest-losing countries with less potential for biodiversity preservation [38]. Similarly, potential for biodiversity benefits does not correlate well with countries that have a high potential for REDD+ income [39], thus suggesting that a relatively low level of biodiversity benefits will result from a purely carbon-focused REDD+ program. Further, carbon-focused forestry may miss important opportunities to secure biodiversity benefits at both local and global scales [26], which may produce policies that serve to disincentivize greater biodiversity protection in the future. Moreover, widespread embrace of REDD+ could displace deforestation pressures caused by global forces (such as agriculture and timber markets) to ecologically important areas that do not participate in the REDD+ program [1]. Similarly, a global REDD+ program could trigger negative social impacts by its operation at the global level. For example,

---

<sup>5</sup> For an example of governance failure, see Human Rights Watch, [30] (concluding that see over fifty percent of logging in Indonesia was illegal during the period 2003-2006).

REDD+ may increase global food prices and simultaneously reduce the ability of the rural poor to meet needs for subsistence agriculture, potentially exacerbating global poverty and exceeding the capacity of international relief efforts [1].

Although the risks to non-carbon values are a primary source of opposition to REDD+, it is precisely this potential for REDD+ to affect a broad range of forest-related issues (albeit in a beneficial way) that explains why some environmental NGOs embrace the program as an opportunity to transform tropical forest governance at the local level [41]. Thus, a key question for the design of REDD+ is whether it will incentivize activities that reduce emissions at the expense of other social or environmental values, or will instead incentivize activities that enhance both carbon-based and non-carbon-based forest services.<sup>6</sup> If REDD+ is conceived of as purely a mitigation program, its international rules are unlikely to provide different levels of incentives based on whether a particular set of forestry measures concentrate exclusively on emissions reduction to the exclusion of other values, or seek to holistically improve forest management (including human systems affecting forest management) [1]. Promoting REDD+ without sensitivity to the broad range of values served by forest systems would, at best, miss significant opportunities to enhance resilience and benefits of forest systems. Because REDD+ mitigation benefits are intended to be “permanent,” missed opportunities in initial implementation may become entrenched failures if maintenance of REDD+ measures becomes a hallmark of forestry law in a given region.

Mere infusion of financing through REDD+ is unlikely to overcome opposition to the program or to prevent the concerns of REDD+ opponents from occurring, and holds out little hope of addressing underlying deforestation drivers such as poverty. REDD+ is developing through international agreement, supranational organizational activity, national and sub-national laws, and forest-specific contracts. In a given forest, any one of these levels of governance could require or incentivize activities to directly address the root causes of deforestation. For example, international incentives for enhancing SFM through improved practices and regulations could play an important role in addressing governance concerns at the national or local level, such as insecure land tenure, overly-complex or burdensome regulatory requirements, and inadequate law enforcement or personnel training [57]. Conversely, failure to address root causes at the international (or supranational) level can set up incentives that may create a domino effect through multiple levels of governance to exacerbate existing social and environmental problems, including both social and environmental vulnerability climate change impacts.<sup>7</sup>

These concerns point to the conclusion that even if REDD+ produces significant changes in tropical forestry to reduce carbon emissions from deforestation, it will not necessarily lead to significantly more widespread practice of SFM in tropical forests. In essence, REDD+ runs the risk of promoting one public good – avoided carbon emissions – at the expense of others [11]. Moreover, there is concern that emphasis on mitigation forestry may undermine management for adaptation [42].

---

<sup>6</sup> To some extent, the increasing use of the term “REDD+” may be intended to signal increased awareness of the program’s non-carbon-based impacts. Since its inception in 2005, the forest-carbon concept discussed here as “REDD+” has been called “RED” (reduced emissions from deforestation), “REDD” (to include forest degradation), and “REDD+.” The last of these terms came into use surrounding the UNFCCC negotiations in Bali in 2007 and is meant to connote inclusion of reforestation and a variety of conservation activities within the ambit of the program. I use the term “REDD+” in this article to discuss the forest-carbon program concept in its broadest form.

<sup>7</sup> The experience of developing countries compelled to comply with International Monetary Fund demands for increased resource export in the 1970s and 1980s provides an illustration of how supranational rules can negatively affect national and subnational policy with devastating consequences.

Thus, an effective REDD+ program will be one that not only reduces carbon emissions, but also includes elements that target forest areas of global importance for other values (such as biodiversity) and counteract the pressure to adopt potentially damaging forestry measures in an effort to achieve the lowest cost emissions reductions. Unfortunately, current international negotiations on REDD+ do not appear likely to create a program capable of tackling these daunting challenges.

General promotion of SFM, such as in Article 2.1(a)(ii) of the Kyoto Protocol, cannot be assumed to be sufficient to prevent negative impacts from REDD+ and, in any event, is inadequate to promote broadly beneficial changes in forest management. The modest safeguards reflected in UNFCCC COP decisions may help to prevent direct social and environmental harm from REDD+ activities, but do virtually nothing to incentivize activities with benefits beyond mitigation [5, 1]. Thus, contrary to rhetoric that sometimes paints REDD+ as a panacea for deforestation and climate change, skepticism is warranted regarding REDD+'s ability to realize broad social and environmental benefits if the program's incentives focus exclusively on emissions reductions, as appears likely, even if general "safeguards" are imposed [1, 5].

The most important set of decisions from the UNFCCC Conference of the Parties toward the establishment of REDD+ has been the Cancun Agreements, which encourages developing country parties to undertake forest-related activities that contribute to mitigation and contemplates developed country support [5]. Although the Cancun Agreements give attention to broader environmental and social issues (particularly in the development of "safeguards" in Annex A), the decision nonetheless identifies REDD+ only as a mitigation program and wrestles primarily with carbon-related issues of implementation. This UNFCCC decision, along with statements and policies of other major players in the development of REDD+, suggest that carbon storage remains the near-exclusive focus of REDD+ efforts [1]. The UNFCCC Conference of the Parties held in Durban in 2011 produced a decision that begins to establish a mechanism for ensuring compliance with the safeguards agreed to in Cancun. However, if the safeguards are not sufficient to support an increase in SFM through REDD+, then compliance with them will not address the problem.

If SFM advocates hope to build upon REDD+'s ability to overcome political obstacles to SFM and serve broader environmental and social goals in tropical forests (i.e., goals often expressed as SFM), something more than safeguards is required. The conceptual basis of REDD+ requires additional breadth – it must become more than a carbon storage program – in order to justify inclusion of elements that effectively incentivize non-carbon benefits.

### **I. ReConceptualizing REDD+: Adaptation, Sustainable Forestry, & Polycentrism**

There is an important and still under-recognized potential synergy between adaptation, SFM, and mitigation. Including adaptation measures in REDD+ implementation makes sense from a climate change mitigation perspective because tropical forest systems face serious risks from climate change itself (for review see Chow et al., this collection) and, thus, long-term mitigation benefits from forests can only be secured through adaptation. Adaptation often presents a strong rationale for incorporating SFM practices. The most practical and theoretically sound means of doing this, particularly within the climate change regime, is to re-define REDD+ as a program that aims to advance both mitigation and adaptation. This is a particularly valuable way to integrate many SFM tenets into REDD+ because there is a very real need for forest management to adopt an adaptation-based approach (regardless of how REDD+ develops), and a very real need to increase actions to support adaptation in developing countries (in forests and elsewhere). Thus, REDD+ can be an opportunity to advance adaptation and, thereby, bolster SFM.

If adaptation considerations come to occupy a primary place among implementation priorities of the REDD+ program, the program must be developed in a way that can facilitate meaningful progress in meeting the myriad local adaptation needs in tropical forests. The program would need to evolve as one that is not strictly top-down, as climate regime components such as the Kyoto Protocol strove to be, but coordinates multiple layers of governance toward achievement of broad global goals in a wide variety of specific implementation contexts. This type of polycentric approach to climate-relevant forestry must be unified by global goals, rules, and incentives, but flexible enough to enable a diverse array of locally-appropriate adaptation measures under the authority of national and subnational governments. Experience with SFM can provide a basis for assessing the value and success of specific measures, as well as a “toolbox” of practices that can support implementation of adaptation-oriented REDD+.

#### **A. The Need for Adaptation in REDD+: Climate Change Impacts on Forest Systems**

In order to sustain mitigation benefits over time, REDD+ measures must include at least some consideration of adaptation. A REDD+ program that incentivizes carbon sequestration without regard to adaptation priorities would not address, and could actually increase, the likelihood that climate change itself will undermine efforts toward long term carbon storage [45, discussing the Amazon]. Climate change effects such as precipitation changes, higher temperatures, and increased fire risk pose considerable threats to forests that are not managed with an eye toward ecological adaptation. As a FAO literature review recently noted, “increasing temperatures, longer dry seasons and increasing CO<sub>2</sub> concentrations in the atmosphere in the long term, are expected to reduce the capacity of forests to store and sequester carbon, possibly converting forests from carbon sinks to carbon sources” [42]. The extent of such climate change impacts will, in many instances, depend partially on management decisions. Likewise, inattention to socio-economic impacts of climate change may directly affect the durability of REDD+ arrangements. In some regions, climate change is expected to exacerbate existing social, economic, and political problems that drive deforestation and degradation. The resilience of tropical forest systems to climate change is uncertain, although significant evidence suggests low resilience over the long term because of the effects that precipitation changes could have on these ecosystems [43]. Further, a proactive adaptation strategy is more likely to minimize climate change impacts on a forest system than a reactive approach [28].

In Latin America, the need for forest governance reform to enable participation in REDD+ has already begun to ease the way toward improved forest governance [44]. This suggests the power of REDD+’s financial incentives to affect the domestic political considerations affecting forest management, but also highlights the importance of getting the incentives right in REDD+ design. Thus, in the Congo basin nations are adopting forestry approaches designed to facilitate REDD+ as a mitigation mechanism without adequate attention to integrating the adaptation measures necessary to ensure the maintenance of forest ecosystem services that are critical for their populations and economies [46]. Accordingly, the current framework for REDD+ may incentivize forestry reforms focused too narrowly on mitigation, leaving adaptation policy for future policy reform.

A REDD+ program that does not address the challenge of climate change impacts on forest systems – or worsens them through exclusion of forest-dependent peoples, disregard for economic impacts of reduced forest-related activity, or concentration of decision-making authority in corrupt regimes – runs a high risk of failure. Thus, achieving the mitigation goals of REDD+ in a way that can be considered permanent will require planning for adaptation – that is, planning to meet the ecological and social needs of REDD+-protected forest systems not only at the time REDD+ measures are initiated, but also as the effects of a changing climate on the system increase. To be successful over the long term, the REDD+ program must find ways to integrate adaptation and mitigation in planning and implementation phases.

Recent literature on forest management supports this view. For example, an international scientific conference on forest adaptation concluded that mitigation and adaptation goals can be met simultaneously, and that management for mitigation will often be more successful when carried out in tandem with management for adaptation [47]. Moreover, the conference report explicitly concludes that this union of mitigation and adaptation goals can be achieved in REDD+ implementation [47]. Other recent scientific work reaches similar conclusions and suggests that a consensus may be emerging on the need for at least some consideration of adaptation in REDD+ activities [48]. Thus, the fundamental mitigation goals of REDD+ may be more effectively achieved if adaptation considerations play a significant role in REDD+ planning and implementation.

REDD+ proponents have begun to recognize the importance of adaptation to successful forest mitigation. Thus, NGOs involved in developing REDD+ have begun to emphasize the importance of adaptation in REDD+ [49], and it is likely to become an increasingly important issue in REDD+ discussions.

#### B. Adaptation Benefits Beyond Mitigation: The Connection with SFM

Beyond meeting REDD+'s mitigation goals, concentration on adaptation in REDD+ planning and implementation offers an opportunity to improve the ecological health and socio-economic sustainability of tropical forest systems. In the absence of actions targeted to support adaptation, the impacts of climate change on forests and the human communities surrounding them may be, as FAO observed, "disastrous" [42, pg. 5]. In essence, climate change poses a challenge for forest management: "to help species and ecosystems to adapt to climate change while at the same time ensuring that ecosystem services are maintained" [42, pg. 5]. This basic challenge will be as important in REDD+ protected forests as elsewhere.

In general, achieving adaptation through REDD+ implementation will benefit from drawing on SFM principles, practices, and experience. More specifically, the uncertainty of future climate change impacts on forests suggests that management approaches capable of meeting SFM objectives in a range of potential future conditions will provide the best chance of enhancing adaptation [28]. This includes a need to plan for the socio-economic effects of climate change.

A REDD+ program that prioritizes broad ecological and social benefits of the type emphasized in SFM has the potential to enhance overall adaptation in tropical forest countries through increasing the resilience of natural systems and through building the capacity of institutions necessary to cope with climate change, as well as supporting the permanence of mitigation benefits achieved through reduced deforestation. FAO, for example, frames the management challenge of REDD+ in terms that suggest an emphasis on SFM and adaptation: "adjusting management practices in favour of carbon accumulation, while at the same time maintaining biodiversity, recognizing the rights of indigenous people and contributing to local economic development" [42, pg. 8].

At a minimum, then, we can conclude that management for adaptation can be consistent with SFM. Increasing recognition of the importance of adaptation for REDD+ and SFM for adaptation provides a direct means of increasing SFM in tropical forests systems that participate in REDD+.

Adaptation and SFM can be understood as complementary to each other. The goals of adaptation and SFM are closely related and, in some ways, intertwined. SFM, as described by one regional FAO report, means:

the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biological diversity, productivity, regeneration capacity, vitality and their potential to fulfill, now and in the future, relevant ecological, economic and social functions, at local, national and global levels, and that does not cause damage on other ecosystems[50].

If climate change threatens maintenance of these aspects of a forest system, achieving SFM will require successful adaptation. If the threats posed by climate change are sufficiently severe that maintenance of pre-existing ecological, economic, or sociological functions is impossible, the concept of SFM may require a re-definition that fully integrates the need for adaptation. In such situations, SFM can be understood in terms of maintaining or, in some instances, creating the most relevant and valuable ecosystem functions attainable.

As a method of forestry, practicing SFM “encompasses the administrative, legal, technical, economic, social and environmental aspects of the conservation and use of forests” [51] and, thus, seeks to influence the same broad range of activities in forest systems that will affect adaptation. SFM seeks to advance a holistic approach to forest management, preservation of biodiversity, equitable benefit sharing, and collaborative governance that can guide REDD+ implementation toward broad adaptation goals, satisfy requirements of equitable implementation, and preserve environmental values while securing arrangements that will reduce emissions and mitigate climate change. Improving SFM in REDD+-protected forests will frequently provide a practical approach to advancing both the mitigation and the adaptation goals of the climate regime.<sup>8</sup> On the ground, experience with SFM can provide a toolbox of concrete forestry measures that advance these dual goals of a REDD+ program reframed to include adaptation and mitigation.

As described by IPCC, adaptation activities are measures that increase resilience by reducing the vulnerability of natural systems to climate change, including activities aimed at reducing pre-existing stressors on forest ecosystems [23]. Such pre-existing stressors include at least the direct drivers of deforestation, such as illegal logging or forest clearing for unsustainable subsistence agriculture, that SFM seeks to address. Governance problems, poverty, and other indirect drivers of deforestation that should be addressed to secure SFM may also be understood as pre-existing stressors on forest systems that warrant attention in adaptation planning. Accordingly, the synergies between SFM and management for adaptation are quite strong in many instances.

Assessing progress toward the goals of adaptation is much more complex than the technical challenge of measuring carbon. Measurement of carbon storage, as technically complex as it may be, seeks to assess the maintenance of the same desired physical result (carbon storage) in a variety of contexts. Measurement of adaptation gains, on the other hand, aims to assess a variety of moving targets.

Examples of specific adaptation goals might include biodiversity conservation, maintenance of ecosystem services such as water purification, and socio-economic goals such as sustainable livelihoods, all of which are public goods that may be required to address climate change impacts or the unintended consequences of human responses to climate change (such as forest clearing to increase arable land in response to climatic pressure on agricultural systems) in a particular area, or may otherwise be important to

---

<sup>8</sup> Several FAO foresters writing on practices for REDD+ contend that “overlap among SFM, forest management for adaptation and forest management for mitigation” is so extensive that “these approaches can, in many cases, be considered functionally equivalent” [52].

maintaining desired ecological or social conditions. Each of these targets has also been the subject of SFM efforts for decades.

Thus, although specific adaptation goals will present complex challenges for resource management, experience with SFM may ease the burden of creating appropriate measures to meet these challenges. SFM provides a knowledge base upon which adaptation-oriented REDD+ implementation should draw.

At the same time, the development of REDD+-related incentives for adaptation activities can increase the likelihood of meeting SFM goals despite the increased stress of climate change. For example, the promise of REDD+ benefits targeted to improve capacity for adaptation could affect the national and regional political economy of deforestation sufficiently to encourage governance reform that draws upon experience with SFM [57]. In other words, incentivizing adaptation can serve to promote SFM, while SFM can provide tools for realizing adaptation goals, and REDD+ can create an overarching structure for facilitating SFM and adaptation.

In one detailed case study of the communities around the Sui River Forest Reserve in Ghana, for example, the authors conclude that “climate change adaptation strategies that are based on the principles of sustainable forest management (SFM) are likely to effectively promote an active participation of local communities in the conservation of forest resources and improve their livelihoods so as to mitigate the negative impacts of climate change” [27]. Moreover, a particular forest management strategy adopted by the government on the basis of SFM principles, known as the “tungya” system, was shown to have significantly enhanced capacity for adaptation in the region [27, pg 21]. This particular region faces pressures primarily related to timber extraction (including government sanctioned industrial logging and illegal timber and charcoal operations) and slash-and-burn forest clearing for agriculture by impoverished communities around the reserve. Climate change impacts are expected to significantly worsen socio-economic conditions, primarily through a decrease in precipitation that will reduce agricultural productivity, and heighten pressure on the forests, as well as negatively affecting biodiversity and water resources in the region. Among other practices, the SFM strategy for the region included awarding parcels of degraded forestland to local community farmers and assisting them in establishing sustainable agricultural operations. According to the study authors, this particular strategy has produced major benefits for livelihood security that not only lessens pressure on the forest, but also enhances the capacity of the community to adapt to climate-driven changes in the area. This program, along with increasing capacity and involvement of local communities in forest management, appears to serve the goals of both SFM and adaptation. It illustrates the potential for SFM to support adaptation and, as reported in the case study, also shows that the need to adapt to climate change can serve as an impetus for adopting aggressive SFM strategies.

FAO has noted that “in many cases, climate change impacts will not be new threats, but rather intensification of already existing threats,” and, therefore “current measures taken may well address climate change effects . . . [including] many SFM practices” [42, pg. 33]. SFM practices designed to support water regulating functions of forests may be particularly important for adaptation strategies because “water resources are likely to be the most affected by future climate change in many parts of the world” [42, pg. 28]. Further, FAO recommends improved training of forest managers on SFM practices as a form of enabling adaptation.

Forest management for adaptation and SFM practices are discussed as complementary in a number of generally applicable research articles as well. One article states “Adaptation in forestry is sustainable forest management that includes a climate change focus” [53]. In “Application of Structured Decision

Making to an Assessment of Climate Change Vulnerabilities and Adaptation Options for Sustainable Forest Management,” the authors describe an approach to identifying management practices that are best able to achieve SFM goals, despite climate change impacts, because they also serve as adaptation measures [28].

### C. REDD+ to Promote SFM

Because of the close connection between adaptation in tropical forests and SFM, effective integration of adaptation considerations into the REDD+ program can also be thought of as an opportunity to build SFM into the incentive structure of REDD+. Just as SFM can provide support to REDD+ implementation, an adaptation-oriented REDD+ program can meaningfully promote SFM. Infusion of adaptation goals into REDD+ has the potential to affect forest-related activities at multiple scales (from global to local), as is necessary to significantly increase SFM penetration in the tropics. At a global level, emphasis on adaptation in REDD+ can provide momentum and resources for SFM efforts that have previously faltered. At the local level, concentration on adaptation considerations in designing REDD+ measures can ensure greater incorporation of practices aimed at both biodiversity preservation and socio-economic benefits [1]. National-level benefits of this form of REDD+ for tropical forest nations could be numerous – including maintenance of essential ecosystem services, increased sustainable livelihoods, and improved governance [26]. Moreover, the UNFCCC regime should recognize promotion of SFM in REDD+ as a powerful tool for making progress on the regime’s adaptation goals while also enhancing the security of mitigation gains from reduced deforestation. Developed country investors (public or private) can benefit from enhanced permanence and security of mitigation commitments that will result from increasing adaptation and SFM measures in REDD+.

Operationalizing a REDD+ program that takes adaptation concerns seriously will require a governance structure capable of incentivizing a diverse array of activities on the basis of their appropriateness to meet particular local or regional needs, which may change over time. Adaptation is essentially non-fungible in that the methods will necessarily depend on local context. Even the meaning of adaptation as a concrete goal must, to some extent, be context-specific. Thus, the direct carbon-for-cash arrangement underlying REDD+’s development as a mitigation program, which depends upon the fungibility of GHG emissions to motivate participation, cannot simply be expanded to include adaptation. Instead, it will be necessary to construct a system of rules and incentives that is both universal in its requirement that adaptation gains be verifiable, and flexible in its ability to address the unique circumstances and needs of each tropical forest country participating in the program.<sup>9</sup> In many instances, it may be particularly important to support local governance capacity development because, as FAO has noted, “[b]uilding sufficient trust to facilitate collaboration may be the biggest challenge of all for future forest management” [42, pg. 8]. Overall, the governance-related drivers of deforestation will likely pose the most difficult obstacles to successfully employing REDD+ to improve forest management. It is highly unlikely that REDD+ will, on its own, significantly affect drivers such as war and dictatorial regimes inattentive to the resources needs of their people, but adaptation-related incentives may prove significant in encouraging more technical governance issues, such as regulatory reforms aimed at reducing illegal logging and associated corruption or improving community input in and benefits from forest management decisions.

---

<sup>9</sup> As one commentator noted in the introduction to a series of articles on forest management for adaptation “The impacts of changing climate will vary locally and while policy to support climate change mitigation is primarily a task for national governments and international agreements and processes, responsibility for supporting adaptation will fall more to national and local governments” [54, pg. 80].



Therefore, the challenge of developing adaptation-related incentives in the REDD+ program is largely a governance challenge. In order for an international REDD+ governance structure to incentivize adaptation activities while satisfying the core mitigation requirements that underlie the program's development, authority must be spread across scales from the level of global goal formation to the local level of activity selection and design.<sup>10</sup> Some of the best discussion of the types of arrangements among governments that will be necessary to meet this challenge is found in the literature on polycentric governance.

#### **D. REDD+ as a Polycentric Program**

REDD+ is developing through a multitude of pathways – UNFCCC negotiations, World Bank and other international organizations' initiatives, project development by international environmental NGOs, bilateral agreements, unique arrangements like the Governors' Task Force, and national and subnational legal reform. All of these developments are occurring in the absence of an overarching multilateral treaty of global applicability. This type of development represents what Elinor Ostrom and others have termed "polycentric governance" because there are numerous actors exercising authority at multiple scales of governance, rather than a primarily top-down governmental structure.<sup>11</sup>

Among the insights of scholarship on polycentric governance is the realization that relationships among different levels of government are particularly important to resource management outcomes [29]. It may seem obvious that the incentives created by "higher" levels of government can be expected to influence the behavior of "lower" levels, but there are few examples of international environmental regimes that capitalize on this insight in anything but the most rudimentary manner. REDD+ could provide an opportunity to operationalize this insight, although a number of administrative challenges will need to be overcome.

The challenge of designing REDD+ to meet adaptation goals will require the creation of incentives at the international level to reward national and subnational actors for measures that advance adaptation in their regions, and that adaptation incentives must operate alongside of the incentives for carbon storage.<sup>12</sup> Considerable literature addresses international and national governance questions associated with REDD+, but relatively few studies examine the connection between local or regional decision-making and larger scales of governance.

One particularly persuasive analysis suggests that community forest management systems can be employed to enhance local authority over forest resources as a means of promoting broad and equitable benefits through REDD+, while achieving national and international objectives [56]. Importantly, the authors note that effectively employing community forest management as an element of REDD+ implementation will require a baseline of secure property rights (including rights to timber resources) and,

---

<sup>10</sup> The challenge of incorporating the diverse informational inputs necessary to create ecosystem-specific activities that can operate to produce internationally verifiable adaptation benefits illustrates the complexity of this endeavor. An adaptation-oriented REDD+ program would need to account for and be able to respond to a wide range of knowledge sources, ranging from global climate change models and regional data on climate change impacts to long-standing local customs and traditional knowledge.

<sup>11</sup> There is a paucity of literature that discusses REDD+ as an example of polycentric governance. Boyd's discussion of the interaction of multiple national and subnational governments with each other and with international institutions is among the most developed analysis of polycentrism and REDD+. [2] Ostrom, it appears, discussed REDD+ only as an example of the complexity of climate-related governance challenges in order to argue against development "only" at the global level [55].

<sup>12</sup> Ideally, mitigation and adaptation will operate synergistically in REDD+. At a minimum, however, it will be necessary to ensure that activities to advance each goal do not interfere with the other.

ultimately, the development of strong locally-adapted governance institutions linked to authorities at multiple scales [56]. This approach requires both a degree of local legal authority over forestry decisions and sufficient local capacity to exercise the authority effectively for SFM. Challenging as this may be in many developing country contexts, it represents the type of progress that funding and political interest associated with REDD+ may be able to secure where prior SFM efforts have failed. As a recent study of Latin American forest management policy challenges suggests, the financial incentives such as those associated with REDD+ may, if appropriately tied to SFM practices, overcome many of the current obstacles to SFM in the region [57].

An international arrangement that effectively incentivizes locally-appropriate adaptation practices through REDD+ implementation by national and subnational actors will face many of the same challenges that are evident in efforts to operationalize the REDD+ concept as a mitigation program as well as some of the challenges that have inhibited SFM in the tropics. Maintenance of ecosystem benefits over time (permanence), ensuring change from business-as-usual (additionality), and equity considerations in the delivery of economic benefits (benefit-sharing) all can be expected to pose similar challenges to REDD+-based adaptation activities as they pose to REDD+ mitigation efforts. In this respect, the already extensive literature on REDD+ as a mitigation program may be helpful to designing adaptation elements as well. The context-specific nature of adaptation adds an element of complexity that is not present in the context of globally-fungible carbon dioxide emissions.<sup>13</sup>

Discussion of how to achieve the types of governance arrangements necessary to incentivize early adaptation actions is noticeably absent from the vast majority of literature and governmental discussion on REDD+.<sup>14</sup> Even where literature attends to the complexities of inter-governmental relationships that will arise in a fully developed REDD+ program, explicit discussion of incentives to promote non-carbon benefits is generally absent [for example, 2]. There is a pressing need for additional work in this area to identify specific decision-making arrangements and incentive structures that can enable REDD+ to become a program that consistently and coherently advances adaptation and SFM.

### **1. Challenges to Integrating Adaptation into REDD+**

Expanding the scope of REDD+ as suggested in this article has the potential to increase the burdens related to REDD+ in three ways: (1) costs imposed on REDD+ sponsors or hosts; (2) complexity of administration and governance; and (3) technical difficulties with verifying adaptation benefits across the diverse array of ecosystems and socio-economic contexts that make up world's tropical forests. These potential challenges to including adaptation among REDD+'s primary goals are outweighed by the likely benefits of improved resilience resulting from adaptation (and SFM) practices, as explained in more detail below.

A system for incentivizing adaptation-related activities may add expense to REDD+ implementation, both because adaptation-related activities themselves may be costly and because adding bureaucratic layers necessarily adds expense. The extent of additional cost will, of course, depend on the type of adaptation measures undertaken and the governance and/or incentive structure employed. Under any reasonably cost-effective approach, however, the additional expense can be understood as necessary to preserve the benefits of the forest system – including, but not limited to, carbon storage and other ecosystem services

---

<sup>13</sup> To some extent, the non-fungibility of adaptation benefits also renders the concept of leakage, which is important to ensuring mitigation benefits from REDD+, inapplicable. However, there may be a similar concern where adaptation measures have the potential to shift pressures on a given forest system to another geographic area.

<sup>14</sup> This may be a reason why opposition to REDD+ remains high in some areas and among some sectors of society, despite the addition of safeguards in UNFCCC COP decisions.

– in the face of climate change threats. In the particular context of REDD+, these expenses may often be justified by the need to maintain mitigation benefits over time and, therefore, might fairly be considered in pricing the carbon stored in the forest. Expenses of other adaptation benefits should be subject to compensation through incentives developed to promote adaptation in REDD+, as discussed in the following section of this article.

Somewhat more difficult are the potential administrative and governance challenges that may arise from expanding REDD+'s scope to include adaptation as a primary goal. However, these concerns reflect a broader challenge for global environmental governance as a whole. Integration of complex issues such as forest adaptation into incentive schemes represents a leading edge of regulatory experimentation to address the apparent failure of efforts to create top-down legalistic (or "binding") international environmental law along the lines of the Montreal Protocol or Kyoto Protocol [1]. In this sense, the core administrative and governance challenges of incorporating adaptation into REDD+ are unavoidable and must be tackled in some form if the program is to achieve its promise as a cost-effective method of mitigation that, at a minimum, maintains existing ecologically and socially important forest services. Thus, in this respect, the proposed focus on adaptation can be understood as focusing and formalizing the type of review and assessment that is already necessary for REDD+ hosts to demonstrate compliance with UNFCCC "safeguards" and need be no more complex than the protocols of existing protocols for certifying non-carbon aspects of REDD+ projects or measures for the voluntary carbon market. [see 58]. It is because of the governance challenges faces REDD+ that theoretical work pushing the envelope of resource management approaches and collective action – such as the challenge of polycentric governance literature to the "tragedy of the commons" and other resource management metaphors – may hold key necessary insights for the development of an effective REDD+ program, as discussed in the preceding section of this article [59].

Finally, the complexity of forest management for adaptation could be argued to present too great a technical challenge for the emerging REDD+ program to bear, should adaptation goals be accepted as a target of incentivization through the program. Under this line of thinking, one might suggest that the complexities of the carbon market and "REDD readiness" place enough strain on the potential of REDD+ to improve forestry practices, so adaptation efforts should be handled separately. However, this argument risks missing the opportunity to capitalize on synergies between adaptation and mitigation. As discussed above, some measure of adaptation activities will be necessary to achieve REDD+ mitigation gains. The incorporation of adaptation as an explicit goal builds upon this reality and provides a means of (1) rewarding REDD+ development that goes beyond the bare minimum of adaptation to support mitigation and (2) encouraging the development of synergistic opportunities, such as maintaining or replanting an ecologically diverse forest that supports multiple (carbon and non-carbon) values rather than concentrating on a few fast-growing tree species to sequester carbon. The incorporation of SFM as a knowledge-base and toolbox of practices and assessment criteria can reduce the administrative strain of considering adaptation alongside mitigation. Moreover, experience under existing assessment protocols – such as certification of REDD+ projects by CCBA to meet a "gold standard" based on adaptation benefit – provides evidence that the technical challenge is not insurmountable [58].

Along with the cost, complexity, and technical difficulty arguments against formally requiring adaptation in REDD+ measures, there is a political challenge. Imposing adaptation requirements through REDD+ would arguably push international regulation deeper into the domestic sovereign space of developing countries hosting REDD+. However, this concern can be avoided by making the proposed adaptation component of REDD+ voluntary and separable from its mitigation goals. Moreover, tropical forests countries have themselves noted, at least occasionally, the importance of considering adaptation in

REDD+. For example, Nicaragua, on behalf of several nations, sought “consideration of the synergy between adaptation and mitigation, and within which REDD+ options are particularly relevant” [60].

## **2. A Practical Framework for Incentivizing Adaptation and SFM Through REDD+**

There are several possible arrangements for operationalizing the central recommendation of this article, that the REDD+ program should explicitly promote adaptation through incorporation of SFM practices into projects or measures. Three features are needed: a legal or other structure for promoting adaptation considerations, a system of incentives (which may require additional financing), and a means of assessing adaptation benefits. I have developed proposals for meeting similar goals elsewhere [1, 61, 62] and merely highlight key points here.

Adaptation goals can be built into REDD+ through formal rules of international institutions with extensive involvement in REDD+, bilateral agreements, or national law. Ideally, the goals of the REDD+ program should be established by authoritative international institutions, if not in a treaty. To maximize the applicability and legitimacy of including adaptation as a co-equal goal with mitigation in REDD+, this concept should be established through UNFCCC COP decisions or other multilateral climate-related agreements. In the absence of such an agreement, however, the importance of advancing adaptation through REDD+ can be built into the emerging program in other ways. Major REDD+ supporters, including international institutions and developed countries such as Norway, could use funding conditions or bilateral agreements to require demonstration of adaptation gains in the same manner as they require proof of carbon sequestration. The importance of adaptation might also gain prominence through an arrangement of informal voluntary market preferences that becomes sufficiently robust to make adaptation measures a de facto requirement for receiving REDD+ financial benefits. Although this approach has the lowest level of legality, it provides the greatest opportunity for direct civil society involvement and, therefore, may be the most likely as private entities involved with REDD+ become increasingly aware of the importance of adaptation to REDD+.

Incentives similar to REDD+ mitigation incentives should be created to effectively promote adaptation in REDD+ activities. In their most straightforward form, such incentives could consist of direct compensation for the marginal expenses of specific adaptation activities. More complex incentives, such as investments that build upon adaptation gains of REDD+ measures, should be explored if the concept is to be operationalized.

Ideally, the value of purported adaptation activities should be assessed and rewarded independent of carbon measurement because this will allow maximum flexibility in the design of REDD+ measures by project sponsors and/or developing countries. As I have suggested elsewhere [1], the complexity and non-fungibility of adaptation activities may be most suitable for assessment by non-state entities experienced in other forms of forestry certification. In essence, the protocols developed for measuring SFM under various forestry certification schemes can be a starting point for assessing the use of SFM or other practices to meet adaptation in a given forest context. Enabling private (non-state) organizations with detailed knowledge of particular regions to become recognized auditors of adaptation activities in REDD+ planning and implementation would support development of context-sensitive assessment and could give rise to consultancy entities specializing in assisting to create forest adaptation measures for REDD+. An appropriately context-sensitive assessment would be based upon general goals established at the global level, such as the importance of maintaining or enhancing water regulation services in areas likely to be negatively affected by precipitation changes, combined with the particular circumstances and needs of the geographic area affected by the REDD+ measures, as well as some formal recognition of the

need to maintain management flexibility to respond to unexpected (or different than expected) climate change impacts that may develop.

Approaches that do not directly draw on experience assessing forests for SFM-related certification (such as direct assessment by an international organization, donors, or host countries), may also be viable. However, these options may increase the potential for political conflict among participants. Employing private entities specialized in forestry assessment serves to introduce a relatively neutral third party whose reputation will depend on the consistent accuracy of the assessments it conducts.

Financing for adaptation incentives presents a series of complex questions, the details of which cannot be fully explored in this brief article. However, it is worth noting that adaptation gains are likely less suitable than carbon storage to market-based incentives. Although it is possible to imagine a payment for ecosystem services market applicable to REDD+ adaptation measures, the complexity of developing and monitoring such a structure on a global scale is such that more direct fund-based options for providing incentives are preferable. These could be financed through existing UNFCCC regime funds – such as the Adaptation Fund or Green Climate Fund (which is currently envisioned to support mitigation through REDD+ and is broadly authorized to support adaptation) – through a new “REDD+ Adaptation Fund,” or through a variety of other arrangements (such as bilateral agreements or international organizations’ contracts with funding recipients).

Accordingly, there are a variety of potential avenues to operationalizing the central recommendation of this article. The keys are (1) ensuring that further development of the REDD+ program includes a focus on developing the adaptation potential of the forestry reforms it catalyzes and (2) establishing appropriate incentives to bring REDD+ development decisions in line with the new dual focus on adaptation along with mitigation. Any arrangement that meets these two criteria will, almost by definition, provide a significant boost to efforts to increase SFM in tropical forest nations that adopt REDD+ and, thereby, build upon the political successes of REDD+ in overcoming obstacles to preserving tropical forests and enhance its success in realizing similar successes on the ground in the forests.

## **II. Conclusion**

The current vision of REDD+ holds promise for overcoming the persistent political barriers that played a role in thwarting prior efforts toward an MEA for forests because it enables voluntary participation by developing countries and provides a means of facilitating adequate financial support from developed countries. The long-term success of the mechanism remains doubtful, however, because it does not appear well designed to meet the complex and varied drivers of deforestation throughout the tropics, nor does it provide an incentive to plan for the impacts of climate change on the forests.

Incorporating an adaptation component into the REDD+ program could rectify this problem by requiring attention to broad environmental and social impacts and, on the whole, infusing a greater concentration on SFM into REDD+ activities. With this addition, REDD+ would be uniquely poised to provide a turning point in the long and frustrating effort to design international legal mechanisms for securing SFM throughout the tropical forest regions.

Infusing adaptation goals into REDD+ will require relatively complex multi-level governance arrangements that effectively incentivize locally-appropriate adaptation activities. There is currently no successful model for this approach. However, the type of polycentric incentive-based arrangement called for in this article reflects the need to develop new approaches to global environmental problems. As in the forestry

negotiations of the 1990s, the international community is unable to secure an adequate top-down multilateral environmental agreement to address urgent threats such as climate change and biodiversity loss. Perhaps REDD+ can highlight a path forward by bringing within its ambit not only the isolated issue of fungible carbon storage, but also the broad range of environmental and development concerns affected by the context-specific issues of adaptation. Relevant institutions, finance, and political interest in REDD+ can be directed toward adaptation through a recognition of the need to sustain forests – for their carbon storage value among other reasons – through the coming impacts of climate change. Adaptation can become a co-equal goal of REDD+ and parallel incentives can be created. In this way, emphasis on adaptation in REDD+ could support the spread of SFM in the tropics and create an opportunity to test the viability of multi-issue environmental programs designed to draw upon a polycentric arrangement of authority across scales and around the world.

## Acknowledgements

This article is based on a presentation at the International Society of Tropical Foresters Annual Conference, “Tropical Forests Under a Changing Climate: Linking Impacts, Mitigation, and Adaptation,” February 11-13, 2009, Yale University.

## References

- [1] Long, A. 2011. Global Climate Governance to Enhance Biodiversity & Well-Being: Integrating Non-State Networks and Public International Law in Tropical Forests. *Environmental Law* 41:95-164.
- [2] Boyd, W. 2011. Climate Change, Fragmentation, and the Challenges of Global Environmental Law: Elements of a Post-Copenhagen Assemblage, U. Pa. J. Int’l L. 44: 457-550.
- [3] Thompson, M.C., Baruah, M., Carr, E.R.. 2011. Seeing REDD+ as a project of environmental governance. *environmental science & policy* 14: 100 – 110.
- [4] Nepstad,D., Moutinho,P., Boyd,W., Azevedo, A., Bezerra,T., Smid,B., Stabile,M., Stickler,C., Stella, O. 2012. Reframing REDD+: Unlocking jurisdictional REDD+ as a policy framework for low-emission rural development: research results and recommendations for governments. IPAM International Program, San Francisco.
- [5] UNFCCC. 2010. Decision 1/CP.16: The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention The Conference of the Parties. FCCC/CP/2010/7/Add.1.
- [6] Dimitrov, R.S. 2005. Hostage to Norms: States, Institutions and Global Forest Politics. *Global Environmental Politics* 5:1-24.
- [7] Long, A. 2012 (in press). REDD+ and Indigenous Peoples in Brazil. In: *Climate Change, Indigenous Peoples and the Search for Legal Remedies*. Randall S. Abate & Elizabeth Ann Kronk, (Eds.) pp. 151-177. Edward Elgar Publishing.
- [8] United Nations. 1992a. Nonlegally binding authoritative statement of principles for a global consensus on the management, conservation and sustainable development of all types of forests. Rio de Janeiro. A/CONF.151/6/Rev.1.
- [9] Sands, P. 2003. *Principles of International Environmental Law* (2nd ed.). Cambridge University Press, New York
- [10] Humphreys, D. 2006. *Logjam: Deforestation and the Crisis of Global Governance*. Earthscan, London.
- [11] Humphreys, D. 2008. The politics of “Avoided Deforestation”: Historical context and contemporary issues. *International Forestry Review* 10:433-442.
- [12] Long, A. 2006. Auditing for Sustainable Forest Management: The Role of Science. *Columbia Journal Of Environmental Law* 31: 1.

- [13] Cashore, B. et al. 2006. Introduction. In: *Confronting Sustainability: Forest Certification In Developing And Transitioning Countries* 7. Cashore, B. et al. (Eds).
- [14] Cashore, B., et al., Forest Certification in Developing and Transitioning Countries: Part of a Sustainable Future?, *Environment* 48.
- [15] Peter Dauvergne & Jane Lister. 2010. The Prospects and Limits of Eco-Consumerism: Shopping Our Way to Less Deforestation? *Org. & Env't* 23:132, 138–40.
- [16] William Boyd. 2010. Ways of Seeing in Environmental Law: How Deforestation Became an Object of Climate Governance. *ECOLOGY L.Q.* 37:843, 845.
- [17] United Nations. 1992b. Rio Declaration on Environment and Development. A/CONF.151/26. Rio de Janeiro.
- [18] United Nations. 1972. Declaration of the United Nations Conference on the Human Environment, Stockholm, Sweden.
- [19] United Nations. 2007. A/C.2/62/L.5. Non-legally binding instrument on all types of forests. New York.
- [20] Humphreys, D. 2005. The Elusive Quest for a Global Forests Convention. *Review of European Community and International Environmental Law (RECIEL)* 14:1-10.
- [21] United Nations. 1992c. United Nations Framework Convention on Climate Change. Rio de Janeiro.
- [22] United Nations. 1997. Kyoto Protocol to the United Nations Convention on Climate Change. Kyoto, Japan.
- [23] Intergovernmental Panel on Climate Change. 2007. *Climate Change 2007: Synthesis Report*.
- [24] Stern, N. 2007. *The Economics of Climate Change: The Stern Review*. Cambridge University Press, New York.
- [25] PBS Frontline World & Center for Investigative Journalism, The Carbon Hunters, (May 10, 2010), available at: <http://www.pbs.org/frontlineworld/stories/carbonwatch/2010/05/the-carbon-hunters.html> (last accessed January 20, 2012)
- [26] Levin, K., McDermott, C., and Cashore, B. 2008. The climate regime as global forest governance: can reduced emissions from Deforestation and Forest Degradation (REDD+) initiatives pass a 'dual effectiveness' test? *International Forestry Review* 10:538-549.
- [27] Albert Ahenkan and Emmanuel Boon, Climate Change Adaptation through Sustainable Forest Management: A Case Study of Communities around the Sui River Forest Reserve, Ghana, prepared for 18th Commonwealth Forestry Conference, available at: <http://www.cfc2010.org/papers/session7/ahenkan-s7.pdf> , pg 21
- [28] Ogden, A. E., and J. L. Innes. 2009. Application of structured decision making to an assessment of climate change vulnerabilities and adaptation options for sustainable forest management. *Ecology and Society* 14(1): 11.
- [29] Andersson, K.P., Ostrom, E. 2008 Analyzing decentralized resource regimes from a polycentric perspective. *Poicy Sciences*. 41: 71-93.
- [30] Human Rights Watch. 2009. "Wild Money": The Human Rights Consequences of Illegal Logging and Corruption in Indonesia's Forestry Sector.
- [31] Brown, M. L. 2010. Limiting Corrupt Incentives in a Global REDD+ Regime. *Ecology Law Quarterly* 37:237-26.
- [32] FAO. 2009. State of the World's Forests. Food and Agriculture Organization, Rome, Italy.
- [33] Boas, H. et al. 2011. No REDD+ Papers, Volume 1. Available at: [http://www.REDD+-monitor.org/wordpress/wp-content/uploads/2011/11/noREDD+papers\\_download.pdf](http://www.REDD+-monitor.org/wordpress/wp-content/uploads/2011/11/noREDD+papers_download.pdf)
- [34] Mark Shapiro, GM's Money Tree, Mother Jones (November/December 2009), available at: <http://motherjones.com/environment/2009/11/gms-money-trees> .).

- [35] Dooley, K., Griffiths, T., Leake, H., and Ozinga, S. 2008. Cutting Corners: World Bank's forest and carbon fund fails forests and peoples. [www.fern.org/sites/fern.org/files/document%20cutting%20corners.pdf](http://www.fern.org/sites/fern.org/files/document%20cutting%20corners.pdf)
- [36] Lovera, S., Pollini, J., Sena, K., and Borrini-Feyerabend, G. 2008. The hottest REDD+ issues: Rights, Equity, Development, Deforestation and Governance by Indigenous Peoples and Local Communities. [www.rightsandresources.org/documents/files/doc\\_904.pdf](http://www.rightsandresources.org/documents/files/doc_904.pdf).
- [37] Acheampong, E., Marfo, E. and Opuni-Frimpong, E. 2012. Fractured tenure, unaccountable authority, and benefit capture: Constraints to improving community benefits under climate change mitigation schemes in Ghana. *Conservation and Society*. 10.161.
- [38] Venter, O., Laurance, W.F., Iwamura, T., Wilson, K.A., Fuller, R.A., and Possingham, H.P. 2009. Harnessing Carbon Payments to Protect Biodiversity. *Science* 326:1368.
- [39] Ebeling, J. and Yasue, M. 2008. Generating Carbon Finance Through Avoided Deforestation and Its Potential to Create Climatic, Conservation and Human Development Benefits. *Philosophical Transactions of The Royal Society* 363:1927-1924.
- [40] TNC, Climate Change: Where We Work: Confronting the Problem, Globally and Locally, available at: <http://www.nature.org/ourinitiatives/urgentissues/climatechange/placesweprotect/guaraqueaba-climate-action-project.xml> (last accessed April 23, 2012).
- [41] Wertz-Kanounnikoff, S. and Kongphan-apirak, M. 2009. Emerging REDD++: A preliminary survey of demonstration and readiness activities (CIFOR Working Paper 46).
- [42] Food and Agriculture Organization of the United Nations (FAO), Forests Management and Climate Change: A Literature Review, Forests and Climate Change Working Paper 10, Rome 2012.
- [43] Secretariat of the Convention on Biological Diversity. 2009. Forest Resilience, Biodiversity, and Climate Change: A Synthesis of the Biodiversity/Resilience/Stability Relationship in Forest Ecosystems. CBD Technical Series No. 43.
- [44] Contreras-Hermosilla, A. 2011. People, Governance and Forests—The Stumbling Blocks in Forest Governance Reform in Latin America, *Forests*. 2: 168-199; doi:10.3390/f2010168 at 193).
- [45] Jones, C., Lowe, J., Liddicoat, S. & Betts, R. YEAR. Committed terrestrial ecosystem changes due to climate change. *Nature Geoscience* 2:447.
- [46] Dis J. Sonwa & Johnson N. Nkem & Monica E. Idinoba & Mekou Y. Bele & Cyprain Jum. 2012. Building regional priorities in forests for development and adaptation to climate change in the Congo Basin. *Mitig Adapt Strateg Glob Change* 17:441–450, DOI 10.1007/s11027-011-9335-5.
- [47] Bernier, P. and Schoene, D. 2009. Adapting forests and their management to climate change: an overview. *Unasylva* 60.
- [48] Locatelli, B. et al. 2011. Forests and Climate Change in Latin America: Linking Adaption and Mitigation. *Forests*.
- [49] Panfil, S. Designing REDD+ Projects for Adaptation. Presentation made in connection with COP 17 in Durban, available at: <http://REDD+-net.org/files/Steve%20Panfil%20REDD+-Net%20presentation%20on%20REDD++%20and%20adaptation.pdf>
- [50] Food and Agricultural Organization of the United Nations, Regional Office for Asia and the Pacific. 2000. Development Of National-Level Criteria And Indicators For The Sustainable Management Of Dry Forests Of Asia: Workshop Report. Bangkok, Thailand.
- [51] Food and Agricultural Organization of the United Nations. Promoting sustainable management of forests and woodlands (webpage), available at: <http://www.fao.org/forestry/sfm/en/>
- [52] Broadhead, J.S., Durst, P.B., and Brown, C.L. 2009. Climate change: will it change how we manage forests? *EFTRN News* 50:57-65.
- [53] Spittlehouse, D.L. and Stewart, R.L. 2003. Adaptation to climate change in forest management. *BC Journal of Ecosystems and Management* 4.



- [54] Keenan, R.J. 2012. Adaptation of Forests and Forest Management to Climate Change: An Editorial, *Forests*.3: 75-82.
- [55] Ostrom, E. 2012. Nested externalities and polycentric institutions: must we wait for global solutions to climate change before taking actions at other scales? *Economic Theory*. 49:353-369.
- [56] Cronkleton, P., Bray, D.B., and Medina, G. 2011. Community Forest Management and the Emergence of Multi-Scale Governance Institutions: Lessons for REDD++ Development from Mexico, Brazil and Bolivia. *Forests* 2: 451-473; doi:10.3390/f2020451, available at: [www.mdpi.com/journal/forests](http://www.mdpi.com/journal/forests)
- [57] Nasi, R., Putz, F.E., Pacheco, P., Wunder, S., and Anta, S. 2011. Sustainable Forest Management and Carbon in Tropical Latin America: The Case for REDD+., *Forests* 2:200-217; doi:10.3390/f2010200, available at: [www.mdpi.com/journal/forests](http://www.mdpi.com/journal/forests)
- [58] CCBA. 2008. Climate, Community and Biodiversity Project Design Standards. Available at: [http://www.climate-standards.org/standards/pdf/ccb\\_standards\\_second\\_edition\\_december\\_2008.pdf](http://www.climate-standards.org/standards/pdf/ccb_standards_second_edition_december_2008.pdf)
- [59] E. Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action*, Cambridge University Press, New York, 1990.
- [60] UNFCCC. 2009 Nicaragua on behalf of Guatemala, Dominican Republic, Honduras, Panama and Nicaragua. Adaptation—Proposal on the long-term agreement within the framework of the Bali Action Plan. In the Proceedings of Ad hoc Working Group on Long-Term Cooperative Action under the Convention, Sixth session, Bonn, Germany, June 2009 at 35.
- [61] Long, A. 2009. Taking Adaptation Value Seriously: Designing REDD+ to Protect Biodiversity. *Carbon & Climate Law Review* 3:314- 323.
- [62] Long, A. 2010. Tropical Forest Mitigation Projects & Sustainable Development: Designing U.S. Law for a Supportive Role. *William Mitchell Law Review* 36: 101.
- [63] Butler, R.A., and Laurance, W.F. 2008. New Strategies For Conserving Tropical Forests. *Trends in Ecology and Evolution* 23:469.