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POLICY PERSPECTIVE

REDD+ and Biodiversity Conservation: A Review of the Biodiversity Goals, Monitoring Methods, and Impacts of 80 REDD+ Projects

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Abstract

Reducing emissions from deforestation and forest degradation (REDD+) presents an unprecedented opportunity to conserve biodiversity, but whether these biodiversity benefits are delivered will depend on how REDD+ is designed and implemented. In order to inform ongoing policy discussions on REDD+ and biodiversity, we examined how 80 existing REDD+ projects are addressing biodiversity issues, assessing the types of biodiversity benefits these projects aim to provide, the activities they are undertaking to achieve biodiversity goals, their plans for monitoring biodiversity, and the types of biodiversity impacts they are delivering. While all 80 REDD+ projects described biodiversity conservation goals, these goals typically lacked specificity. Furthermore, in 33 of 80 projects, there was a lack of coherence across the stated biodiversity goals, project activities and intended monitoring plans. The lack of specific goals and logical links between these goals, project interventions and monitoring suggests that the projects will have difficulty achieving and measuring biodiversity impacts. Future REDD+ projects and national level REDD+ programs could enhance the biodiversity outcomes by more explicitly articulating biodiversity goals, carefully identifying and addressing threats to biodiversity, tailoring interventions and monitoring plans to specific goals and threats, and more explicitly linking REDD+ activities to national biodiversity conservation efforts.

Introduction

Following nearly a decade of debate, the United Nations mechanism to reduce emissions from deforestation and forest degradation (REDD+) is quickly moving to full implementation. The criteria that countries must meet to be eligible for REDD+ payments were approved in 2013 (UNFCCC 2013) and in 2014 countries began presenting the required elements of their REDD+ programs to the international community (UNFCCC 2015). However, several issues are still being negotiated under the United Nations Framework Convention on Climate Change (UNFCCC), including whether to provide additional methodological guidance on the application of the REDD+ safeguards that were adopted in Cancun in 2010 (UNFCCC 2010).

The Cancun COP decision requires that countries "promote and support" safeguards, including that REDD+ actions "...are consistent with the conservation of natural forests and biological diversity, ensuring that [these actions] are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation of natural forests and their ecosystem services, and to enhance other social and environmental benefits" (UNFCCC 2010). However, they provide no technical details about how countries should promote and support this safeguard. In upcoming negotiations, countries will decide whether the UNFCCC should provide more guidance, such as how the biodiversity impacts of REDD+ should be monitored over time, and how biodiversity goals and impacts should be communicated. These decisions are critical for biodiversity conservation as they will shape REDD+ implementation and could determine the extent to which REDD+ can deliver on its promise to conserve unprecedented areas of diverse tropical forests (Harvey *et al.* 2010; Gardner *et al.* 2012).

When the REDD+ safeguards were defined in 2010, there was scarce empirical information available to inform UNFCCC decisions. Today, there are more than 100 voluntary market forest carbon projects around the world, most of which apply the Climate, Community and Biodiversity (CCB) Standards (Peters-Stanley 2014). The CCB Standards, like the UNFCCC safeguards, require that REDD+ activities both avoid biodiversity harm and generate positive environmental impacts (CCBA 2005, 2008). These projects can therefore provide important insight into the ways that national REDD+ programs may address biodiversity issues.

The aim of this article is to analyze how existing REDD+ projects are addressing biodiversity issues and to provide recommendations to policy makers and practitioners on how to improve biodiversity outcomes from national REDD+ programs. The specific objectives are to: (1) document the biodiversity goals of REDD+ projects and the approaches used to achieve these goals; (2) describe the biodiversity monitoring being applied in REDD+ projects and examine if this monitoring is sufficient to detect potential biodiversity outcomes; (3) assess whether there is consistency between the identified threats to biodiversity, project interventions and proposed biodiversity monitoring within projects; (4) examine the types of biodiversity benefits that REDD+ projects claim to deliver; and (5) use this information to make recommendations that can strengthen the ways in which biodiversity is treated in emerging UNFCCC and national-level REDD+ policies, as well as in related policies (e.g., the Convention on Biological Diversity's Aichi Targets [Convention on Biological Diversity 2010], and the emerging Sustainable Development Goals [United Nations General Assembly 2014]).

Methods

To assess how existing REDD+ projects are addressing biodiversity issues, we conducted a desk review of all publically available documents of 80 REDD+ projects that are using the first or second edition of the CCB Standards (CCBA 2005, 2008). These projects included all of the active English-language projects that had initiated a CCB Standards validation audit as of August 31, 2013.

The CCB Standards require that projects provide a summary of biodiversity objectives, describe project activities that are expected to have biodiversity impacts, use appropriate methodologies to document changes in biodiversity due to project activities, and include a biodiversity monitoring plan. For each project, we reviewed the project design document (PDD) which describes how the project will meet each of the criteria in the CCB Standards and is typically 100–200 pages. We also reviewed the Project Implementation Report (PIR) that synthesizes the initial results of implementation for the 15 projects that had published them. Both the PDD and the PIR are public documents (posted at www.climate-standards.org).

All 80 projects included activities that are considered part of REDD+ as defined by the UNFCCC (UNFCCC 2010). As some of the projects focused on reforestation while others focused primarily on emissions reductions, we categorized these into two groups: (1) afforestation/reforestation (A/R) projects ($n = 47$) which seek to sequester carbon through tree planting, which is a form of carbon stock enhancement under UNFCCC terminology; and (2) reduced emissions (RE) projects ($n = 33$) that seek to reduce emissions from deforestation or degradation.

For each project, we recorded basic characteristics (e.g., project type, size, location) and reviewed documents for descriptions of biodiversity goals, stated threats to biodiversity, planned biodiversity interventions, monitoring plans, and monitoring results. We also assessed whether the descriptions of interventions and monitoring plans were aligned with the stated biodiversity goals. For example, if an A/R project stated a goal of restoring native habitat, we checked that the project actions were consistent with this goal (e.g., planting native tree species) and that monitoring was designed to be able to determine if native habitat had been successfully restored. For RE projects, we similarly considered the alignment of biodiversity goals, interventions, and monitoring with identified threats to biodiversity.

Results

The 80 projects were located in 34 countries, with 36 projects (21 A/R, 15 RE) located in global biodiversity hotspots (Figure 1; Mittermeier *et al.* 2011). The A/R projects averaged 6,493 ha in size (range: 17–132,629 ha; $\sigma = 21{,}365$) while the RE projects averaged 192,202 ha (range: 235–1,351,964 ha; $\sigma = 291{,}331$). The mean start year of the projects was 2007 (range: 1997–2013, $\sigma = 3.37$).

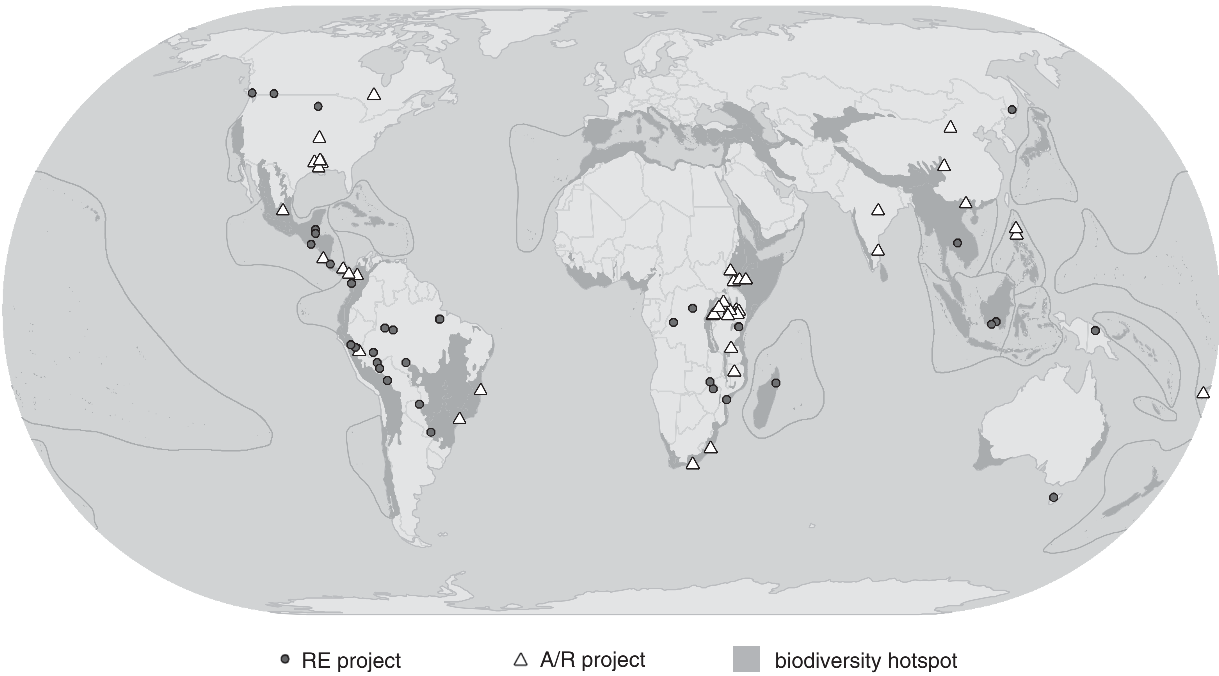

Figure 1 The distribution of the 80 projects reviewed for this study, overlaid on a map of biodiversity hotspots (Mittermeier *et al.* 2011). RE refers to projects seek to reduce emissions, for example through preventing deforestation. A/R refers to afforestation and reforestation projects.

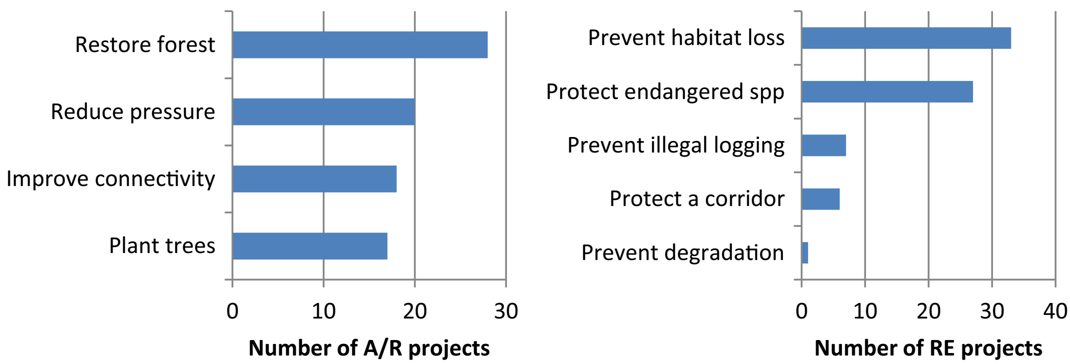

Figure 2 Biodiversity goals of afforestation/reforestation (A/R) projects (left) and reduced emissions (RE) projects (right).

Goals and approaches to biodiversity conservation

The biodiversity goals of the REDD+ projects differed by project type (Figure 2). Of the 47 A/R projects, the most common goal was to restore natural forest, thereby enhancing biodiversity conservation (28 projects). Additional goals included establishing tree plantations in degraded lands to provide habitat (17), reducing pressure on nearby forests by producing timber or fuel wood (20), or improving the connectivity between patches of native habitat by increasing tree cover within the landscape (18). The A/R projects varied greatly in their use of native tree species. Eighty-nine percent of the 47 A/R projects planned to plant at least one native species, but only 48% of the projects used native species exclusively. Projects planted a mean of 18 native species (range: 0–127 spp; $\sigma = 29.8$), which represented, on average, 70% of the trees planted in each project (range 0–100%, $\sigma = 41$).

All 33 of the RE projects had the biodiversity objective of preventing the loss of native forest habitat and 27 of these projects also had goals of protecting threatened plant or animal species. Additional biodiversity goals included preventing illegal logging (7), protecting habitat corridors (6), or preventing habitat degradation (1).

None of the projects provided quantitative targets for the biodiversity objectives. For example, none of the A/R projects included quantitative targets for restoration, such as the reestablishment of animal populations, or the degree to which pressure on other forest would be reduced. Similarly, the RE projects did not include target population sizes for the endangered species in the project areas, or target indices of connectivity.

Monitoring biodiversity impacts

All projects presented some description of how they would monitor biodiversity impacts (Table 1), but these typically lacked details on sampling design and methodology. Among the 47 A/R projects, 46 planned to monitor the number or area of trees planted and for 14 projects this was the only biodiversity-related indicator described. Smaller numbers of A/R projects planned to conduct systematic surveys of fauna (15 projects) or flora (12) within reforested areas. Only two of the A/R projects indicated plans to monitor threats to biodiversity, such as the presence of invasive species or the rate of agricultural conversion adjacent to the project site

Among the 33 RE projects, the extent of intact forest was the most common (29 projects) biodiversity indicator. A subset of the projects planned to conduct systematic surveys of fauna (18) or flora (13), ad hoc wildlife observations (7), or measurements of populations of threatened species (7). Some projects also indicated they would monitor threats to biodiversity such as poaching (9 projects), fire (4), nearby agricultural conversion rates (2), and invasive species (1).

While all 80 projects listed indicators they planned to monitor, none provided detailed information on the sampling design, the methodology for measuring indicators, or how data would be analyzed. In addition, while all projects described a without-project scenario for biodiversity in the absence of project activities (as required by the CCB standards), none described methods that would permit a quantitative assessment of biodiversity impacts. For example, none of the projects described a biodiversity reference scenario based on quantitative projections of biodiversity indicators or proposed monitoring areas outside of the project as controls (Jagger *et al.* 2009; Pitman 2011).

Alignment among biodiversity goals, interventions, monitoring, and threats

The A/R projects showed mixed levels of alignment between biodiversity goals, planned interventions and monitoring (Table 2). The 28 A/R projects that had the goal of restoring forest planned to plant native species, and all of these projects also planned to monitor restoration efforts. For projects with goals of reducing pressure on native forest (20), there was less apparent alignment with project interventions and monitoring: only eleven of these projects described interventions specific to reducing pressure, and only four described related monitoring activities. Among projects that indicated a goal of improving forest connectivity, there was even less alignment.

In contrast, the RE projects showed stronger alignment among goals, interventions and monitoring (Table 2). All 33 RE projects had goals of preventing the loss of native habitat, had corresponding interventions designed to reduce this loss and had plans to monitor habitat extent. For the 27 projects that indicated a goal of protecting populations of threatened species, each described related interventions (e.g., promotion of alternative livelihoods and patrols to reduce poaching), and all but one indicated plans to monitor species' populations.

While all of the RE projects described threats to biodiversity, the alignment of project goals, actions and monitoring was not clear for all threats. The most commonly cited threats included agriculture, hunting, illegal or unsustainable logging, fire and grazing (Table 3). Though agriculture was a common threat, none of the projects explicitly indicated that addressing this threat was being done specifically for the purpose of conserving biodiversity.

Biodiversity results

Fifteen of the reviewed projects (9 A/R, 6 RE) had reported on the impacts of their activities on biodiversity, after 1–10 years of implementation. Each of the nine A/R projects that reported biodiversity results provided data on the number of native trees established or the area planted and claimed their activities had benefitted biodiversity, but none reported data on changes in plant community composition within the plantations that would indicate that forest was successfully being restored, or measured changes in deforestation pressure on nearby forests. Similarly, none reported data on impacts to population sizes of threatened species or provided other direct measures of the status of faunal communities.

Among the six RE projects that reported initial biodiversity results, four indicated that a greater area of forest habitat had been conserved compared to the without-project scenario. Two projects reported that local communities had received training on biodiversity conservation, thereby contributing to enhanced conservation. One project indicated that the successful conversion of a logging concession to a conservation concession was a biodiversity benefit. Another project stated that monitoring records indicated decreased levels

Table 1 The types of monitoring that 80 REDD+ projects plan to use to document changes to biodiversity, as indicated in project design documents prepared for validation with the Climate, Community and Biodiversity Standards (n/a indicates not applicable)

			A/R ($n = 47$)		RE ($n = 33$)	
		Type of monitoring	number	%	number	%
State indicators	Measures of habitat	Total area/number of trees planted	46	98%	n/a	
		Forest extent	n/a		29	88%
		Connectivity	8	17%	1	3%
		Canopy structure	2	4%	0	0%
	Measures of species composition	Flora surveys	12	26%	13	39%
		Wildlife observations	7	15%	7	21%
		Systematic fauna surveys	15	32%	18	55%
		Population measures of threatened species	2	4%	7	21%
Threat Indicators		Fire frequency	0	0%	4	12%
		Poaching (plants or animals) incidents	0	0%	9	27%
		Frequency or intensity of agricultural conversion	1	2%	2	6%
		Invasive species	1	2%	1	3%

Table 2 Consistency between the biodiversity goals, interventions, and planned monitoring methods of 33 A/R and 47 RE projects. Numbers refer to the number of projects that had a particular goal, planned interventions that were consistent with the goal, or planned monitoring activities that would allow the project developers to monitor whether the goal had been achieved

	Goal	Number of projects	Planned interventions consistent with goal	Planned monitoring consistent goal
A/R projects	Restore natural habitat	28	28	28
	Reduce pressure on native forest	20	11	4
	Improve connectivity	18	2	1
	Plant trees	17	17	17
RE projects	Prevent habitat loss	33	33	28
	Protect threatened species	27	27	26
	Maintain a corridor or reduce fragmentation	6	5	4
	Prevent habitat degradation	1	1	1

of poaching. None of the projects presented quantitative estimates of changes to the populations of threatened species.

Discussion

Our review shows that in practice, REDD+ is likely to have variable outcomes for biodiversity, depending on how biodiversity goals are articulated, implemented, and monitored. One key element for successful biodiversity conservation is having clearly articulated, measurable and time-bound goals (Margoluis & Salafsky 1998). While all projects included biodiversity goals, these were high level and lacked the specificity needed to guide successful implementation. Most projects provided vague goals (e.g., "reduce pressure on native forest" or "conserve habitat") without providing quantitative targets for conservation or indicating the time frame for accomplishing goals. Even in projects aiming to conserve specific threatened species, little information was provided on the initial status of these species within the project area or the specific targets for their conservation (e.g., target population size). This lack of specificity around goals not only constrains the delivery of biodiversity benefits, but also makes it difficult for projects to demonstrate conservation success.

As with any conservation initiative, the biodiversity objectives for REDD+ are more likely to be achieved if there is clear alignment among the threats, goals, interventions and monitoring plans (Dickson & Kapos 2012). The reviewed projects showed varying levels of alignment. While projects with goals of protecting threatened species had clear alignment between threats, interventions and monitoring activities, projects with more indirect biodiversity goals (such as those planning to reduce pressure on natural forest by producing an alternative supply of timber and fuel wood, or those planning to create or maintain forest corridors) included few details on how project interventions and monitoring would achieve those goals. In addition, a subset of

Table 3 Consistency between identified threats to biodiversity and project biodiversity goals, planned interventions, and monitoring as described in the project design documents of the 33 reduced emissions (RE) projects. Numbers refer to the total number of projects that mentioned a given activity as a threat to biodiversity, included specific goals to address the threat and related interventions and monitoring methods. Threats are listed in descending order of frequency of mention

Threat	Threat identified	Goal to address threat	Interventions to address threat	Monitoring relevant to threat
Agriculture	23	0	0	1
Hunting	19	18	14	14
Illegal/unsustainable logging	17	13	12	6
Fire	12	9	8	4
Grazing	10	8	8	5
Fishing	5	5	2	2
Mining	5	0	0	0
Illegal/unsustainable plant extraction	5	4	2	2
Invasive species	2	1	0	0

projects identified threats to biodiversity, but failed to indicate how these threats would be addressed.

Strong monitoring is also essential for realizing positive biodiversity impacts from REDD+, as it allows projects to track their progress towards biodiversity goals and adapt project activities accordingly (Gardner 2010). While all of the projects mentioned biodiversity monitoring plans and listed proposed monitoring indicators, many projects did not clearly identify which methods they would use to monitor specific indicators, the frequency or intensity of monitoring, or how they would be able to discern if changes in biodiversity were the result of REDD+ activities. The limited value of the nonspecific biodiversity monitoring plans is evident in the 15 projects that have already reported initial outcomes of REDD+ implementation on biodiversity: while all 15 projects reported positive biodiversity outcomes, these results were stated in general terms and were based on proxies for biodiversity (e.g., tree plantation establishment and avoided deforestation) rather than on detailed descriptions of changes in plant or animal communities. More detailed, rigorous and longer term monitoring is needed to fully understand the biodiversity impacts of REDD+ projects.

Policy implications

Our review suggests that the current lack of guidance on how to implement the UNFCCC biodiversity safeguards in REDD+ could to lead to mixed and potentially poor performance from national REDD+ initiatives, and that more detailed methodological guidance is needed to ensure that REDD+ delivers on its promise for biodiversity conservation. Here, we provide five key recommendations that apply at the scale of both projects and government-led REDD+ programs.

First, REDD+ initiatives should carefully document the existing status of biodiversity and threats and use this information to select appropriate interventions. Spatially explicit data that shows how REDD+ could affect high conservation value species or habitats and identifies key threats to biodiversity is especially valuable (Gardner *et al.* 2012) and could be used to deliver enhanced biodiversity benefits at no additional cost (Busch 2013). This analysis could also consider potential synergies or trade-offs of REDD+ activities with existing biodiversity priorities (e.g., National Biodiversity Strategies or Action Plans [NBSAP]; Miles *et al.* 2013) as well as mitigation and social goals (Visseren-Hamakers 2012; Venter *et al.* 2013).

Second, biodiversity objectives should more clearly describe the species or ecosystems that will be conserved, and include quantitative, time-bound targets that permit later assessment of whether the goals have been met (Pitman 2011; Richards & Panfil 2011). For example, restoration activities could include targets related to the diversity of the plant communities or the establishment of breeding populations of animal populations over a given period of time. There is an extensive literature on setting goals for biodiversity conservation (e.g., Margules & Sarkar 2007) which could inform the development of effective and measurable biodiversity goals for REDD+. For national REDD+ programs, it would be logical to adopt goals related to existing national commitments, such as the CBD Aichi Targets and NBSAPs (Panfil & Harvey 2014).

Third, REDD+ initiatives should carefully select interventions that will address the threats to biodiversity and achieve the desired biodiversity goals. These will likely include actions to address threats like agricultural expansion, fire, or poaching, but could include the restoration of native tree species, control of invasive species, fire or other activities (Grieg-Gran 2010; Barlow *et al.* 2012). There is a growing body of evidence on which management interventions are effective at achieving conservation goals (e.g., Brooks *et al.* 2013), which could help identify appropriate interventions.

Fourth, monitoring should be planned early in the design of the REDD+ initiative and be designed to both document the progress towards the biodiversity goals and to enable adaptive management of REDD+ activities. Monitoring plans should include details on specific indicators, methods for data collection, a clear sampling framework, and description of the counterfactual that will be used to assess the effects of REDD+ interventions. Counterfactuals could be based on quantitative projections of species populations or habitat extent under a business as usual scenario (Pitman 2011; Richards & Panfil 2011), or could be developed through matching methods (Jagger *et al.* 2009). The extensive literature on how to assess the effectiveness of different interventions in conserving biodiversity (e.g., Mascia *et al.* 2013) could help REDD+ initiatives more effectively track their biodiversity impacts. Where possible, monitoring for REDD+ should also be integrated into existing monitoring systems for biodiversity (Dickson & Kapos 2012; Latham *et al.* 2014).

Finally, REDD+ initiatives should make explicit plans for how monitoring results will be used for informing future implementation through a formal process of adaptive management (Richards & Panfil 2011). REDD+ initiatives are intended to be implemented over many years and must evolve as biodiversity and other impacts are better understood. Engaging forest management authorities together with researchers and managers, early in the design of the monitoring plan can help ensure that monitoring addresses multiple needs and can most effectively improve management action for biodiversity outcomes (Gardner 2010).

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Table. List of projects reviewed.

References

Barlow, J., Parry, L., Gardner, T.A., *et al.* (2012). The critical importance of considering fire in REDD+ programs. *Biol. Conserv.*, **154**, 1-8.

Brooks, J., Waylen, K.A. & Mulder, M.B. (2013). Assessing community-based conservation projects: a systematic review and multilevel analysis of attitudinal, behavioral, ecological, and economic outcomes. *Environ. Evid.*, **2**, 2.

Busch, J. (2013). Supplementing REDD+ with biodiversity payments: the paradox of paying for multiple ecosystem services. *Land Econ.*, **89**, 655-675.

Convention on Biological Diversity. (2010). The Strategic Plan for Biodiversity 2011–2020 and the Aichi Biodiversity Targets. Available from http://www.cbd.int/decisions/cop/?m = cop-10. Accessed 9 January, 2015.

Climate, Community and Biodiversity Alliance. (2005). *Climate, Community and Biodiversity Project Design Standards* (First Edition). Washington, DC.

Climate, Community and Biodiversity Alliance. (2008). *Climate, Community & Biodiversity Project Design Standards* Second Edition. Arlington, VA.

Dickson, B. & Kapos, V. (2012). Biodiversity monitoring for REDD+. *Curr. Opin. Environ. Sustain.*, **4**, 717-725.

Gardner, T.A. (2010). *Monitoring forest biodiversity: improving conservation through ecologically responsible management*. Earthscan, London.

Gardner, T. A., Burgess, N. D., Aguilar-Amuchastegui, N. *et al.* (2012). A framework for integrating biodiversity concerns into national REDD+ programmes. *Biol. Conserv.*, **154**, 61-71.

Grieg-Gran, M. (2010). *Beyond forestry: why agriculture is key to the success of REDD+*. IIED Briefing, London.

Harvey, C.A., Dickson, B. & Kormos, C. (2010). Opportunities for conserving biodiversity through REDD. *Conserv. Lett.*, **3**, 52-61.

Jagger, P., Atmadja, S., Pattanayak, S.K., Sills, E. & Sunderlin, W.D. (2009). Learning while doing: evaluating impacts of REDD+ projects. Pages 281-292 in Angelsen, A., editor. *Realising REDD+: national strategy and policy options*. Center for International Forestry Research, Bogor.

Latham, J.E., Trivedi, M., Amin, R. & D'Arcy, L. (2014). *A sourcebook of biodiversity monitoring for REDD+*. Zoological Society of London, London.

Margules, C. & Sarkar, S. (2007). *Systematic conservation planning*. Cambridge University Press, Cambridge.

Mascia, M.B., Pailler, S., Thieme, M.L., *et al*. (2013). Commonalities and complementarities among approaches to conservation monitoring and evaluation. *Biol. Conserv.*, **169**, 258-267.

Margoluis, R.A. & Salafsky, N. (1998). Measures of success: designing, managing and monitoring conservation and development projects. Island Press, Washington, D.C.

Miles, L., Trumper, K., Osti, M., Munroe, R. & Santamaria, C. (2013). REDD+ and the 2020 Aichi Biodiversity Targets: promoting synergies in international forest conservation efforts. *UNREDD Programme Policy Brief No*. 5. UNREDD Programme Secretariat, Geneva.

Mittermeier, R. A., Turner, W.R., Larsen, F.W. *et al*. (2011). Global biodiversity conservation: the critical role of hotspots. Pages 3-7 in Zachos, F. & Habel, J. C., editors. *Biodiversity Hotspots*. Springer, Berlin.

Panfil, S.N. & Harvey, C.A. (2014). *REDD+ and biodiversity conservation: approaches, experiences and opportunities for improved outcomes*. USAID-supported Forest Carbon, Markets and Communities (FCMC) Program, Washington, DC.

Peters-Stanley, M., ed. (2014). *Turning over a new leaf: state of the forest carbon markets 2014*. Ecosystem Marketplace, Washington, DC.

Pitman, N. (2011). *Social and Biodiversity Impact Assessment Manual for REDD+ Projects: Part 3—Biodiversity Impact Assessment Toolbox*. Forest Trends, Climate, Community & Biodiversity Alliance, Rainforest Alliance and Fauna & Flora International. Washington, DC.

Richards, M. & Panfil, S.N. (2011). *Social and Biodiversity Impact Assessment (SBIA) Manual for REDD+ Projects: part 1— Core Guidance for Project Proponents*. Climate, Community & Biodiversity Alliance, Forest Trends, Fauna & Flora International, and Rainforest Alliance. Washington, DC.

United Nations Framework Convention on Climate Change. (2010). COP decision 1/CP.16: The Cancun Agreements. Available from http://unfccc.int/resource/docs/2010/cop16/eng/07a01.pdf. Accessed 9 January 2015.

United Nations Framework Convention on Climate Change. (2013). COP Decisions 9–15/CP.19: The Warsaw Framework for REDD+. Available from http://unfccc.int/resource/docs/2013/cop19/eng/10a01.pdf. Accessed 9 January, 2015.

United Nations Framework Convention on Climate Change. (2015). Submissions from Parties on proposed forest reference emission levels and/or forest reference levels for the implementation of the activities referred to in decision 1/CP.16, paragraph 70. Available from http://unfccc.int/methods/redd/items/8414.php. Accessed 9 January, 2015.

United Nations General Assembly (2014). Report of the Open Working Group of the General Assembly on Sustainable Development Goals, Document A/68/970. Available from http://www.un.org/ga/search/view˙doc.asp?symbol=A/68/970&Lang=E. Accessed 9 January, 2015.

Venter, O., Possingham, H.P, Hovani, L. *et al*. (2013). Using systematic conservation planning to minimize REDD+ conflict with agriculture and logging in the tropics. *Conserv. Lett.*, **6**, 116-124.

Visseren-Hamakers, I. J., McDermott, C., Vijge, M. J. & Cashore, B. (2012). Trade-offs, co-benefits and safeguards: current debates on the breadth of REDD+. *Curr. Opin. Environ. Sustain.*, **4**, 646-653.

