A REVIEW OF THE BIODIVERSITY GOALS, MONITORING METHODS AND SHORT-TERM IMPACTS OF FOREST CARBON PROJECTS

FOREST CARBON, MARKETS AND COMMUNITIES (FCMC) PROGRAM

APRIL 2014

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Tetra Tech
159 Bank Street, Suite 300
Burlington, Vermont 05401 USA
Telephone: (802) 658-3890
Fax: (802) 658-4247
E-Mail: international.development@tetratech.com
www.tetratechintdev.com

Tetra Tech Contacts:
Ian Deshmukh, Senior Technical Advisor/Manager
Email: ian.deshmukh@tetratech.com

Forest Carbon, Markets and Communities (FCMC) Program
1611 North Kent Street
Suite 805
Arlington, Virginia 22209 USA
Telephone: (703) 592-6388
Fax: (866) 795-6462

Scott Hajost, Chief of Party
Email: scott.hajost@fcmcglobal.org

Olaf Zerbock, USAID Contracting Officer's Representative
Email: ozerbock@usaid.gov

This report was prepared by:
Steven N. Panfil, Conservation International
Celia A. Harvey, Conservation International

This report benefited from reviews by:
Janis Alcorn, former FCMC (currently at Rights and Resources Institute)
Robert O'Sullivan, FCMC
Scott Hajost, FCMC
Diane Russell, USAID

The US Agency for International Development (USAID) has launched the Forest Carbon, Markets and Communities (FCMC) Program to provide its missions, partner governments, local and international stakeholders with assistance in developing and implementing REDD+ initiatives. FCMC services include analysis, evaluation, tools and guidance for program design support; training materials; and meeting and workshop development and facilitation that support US Government contributions to international REDD+ architecture.

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ACRONYMS AND ABBREVIATIONS

A/R	Afforestation/Reforestation
CBD	Convention on Biological Diversity
CCB	Climate, Community and Biodiversity Standards
CO_2	Carbon dioxide
GHG	Greenhouse gas
IUCN	International Union for Conservation of Nature
NBSAPs	National Biodiversity Strategies and Action Plans
REDD	Reducing emissions from deforestation and forest degradation
REDD+	Reducing emissions from deforestation and forest degradation, plus the role of conservation, sustainable forest management, and the enhancement of forest carbon stocks
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

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EXECUTIVE SUMMARY

Reducing emissions from deforestation and forest degradation (REDD+, the plus referring to the role of conservation, sustainable management of forests and enhancement of forest carbon stocks) has the potential to deliver significant biodiversity benefits, but whether these benefits are achieved will depend on how and where REDD+ is designed and implemented. While a global REDD+ mechanism is still under discussion, and detailed policies for its implementation are still in development, there is now a rapidly growing number of smaller scale forest carbon projects that can inform the ways in which biodiversity issues are addressed in a global REDD+ mechanism. This report reviews 17 of the most advanced forest carbon projects (11 afforestation/reforestation [A/R] projects and 6 REDD projects) to determine i) what types of biodiversity benefits forest carbon projects aim to provide and what project activities are being undertaken to achieve biodiversity goals; ii) how these goals relate to national biodiversity strategies; iii)what monitoring is being conducted to measure impacts on biodiversity; and iv) what early evidence exists that forest carbon projects are delivering biodiversity benefits.

Our desk review indicates that while all the projects have specific goals of conserving biodiversity (in addition to enhancing carbon sequestration or reducing greenhouse gas [GHG] emissions), the goals are often general and do not permit a precise assessment of the project's biodiversity impacts. Most of the A/R projects aim to enhance biodiversity conservation by reforesting degraded areas with trees to provide habitat for native plants and animals and improve landscape connectivity. However, these projects provide little information about which species are expected to benefit from the reforested areas and several are planting mainly exotic tree species which have low value as wildlife habitat. The six REDD projects, in contrast, seek to enhance biodiversity by preventing forest (habitat) loss and degradation, creating wildlife corridors, reducing illegal logging, hunting and fishing, and in one case, expanding the area under national park protection. All 6 REDD projects and one of the A/R projects reviewed had explicit goals of conserving threatened species through the conservation of their habitat.

The biodiversity goals of these projects are not explicitly linked to national biodiversity strategies. Of the 17 projects, none made explicit reference to National Biodiversity Strategies and Action Plans (NBSAPs) or other national biodiversity goals. However, six projects are supporting the national protected areas system, either by expanding the area under protection, conserving forest adjacent to protected areas or generating carbon income that will be used to support protected area management. This review suggests that there is scope for much greater integration and coordination of forest carbon activities with national biodiversity planning and conservation efforts to enhance overall biodiversity outcomes.

All but one of the projects had plans for monitoring biodiversity, but these plans are primarily based on the number of trees established or the area of forest conserved, and typically lack indicators which could be used to assess the impact on target species of conservation interest. This is particularly true among the 11 A/R projects: only two of these projects have planned surveys or inventories of wildlife or vegetation. In addition, there was often a mismatch between the stated biodiversity goals of the A/R projects and the proposed monitoring activities. For example, although seven of the A/R projects indicated that one of their biodiversity goals was to create forest connectivity to facilitate wildlife movement, none of these projects included indicators to measure this connectivity or movement. The REDD projects, in contrast, tended to have more detailed (and ambitious) biodiversity monitoring plans. Of the 5 REDD projects with biodiversity monitoring plans, all included a mix of indicators of forest cover, wildlife sightings or surveys, and threats to biodiversity (such as hunting or fires). However, details on how these indicators would be monitored, interpreted and used to inform project activities were not presented in publicly available documents, making it difficult to assess whether the plans are sufficient to detect biodiversity impacts.

Fifteen of the projects reviewed indicated that they had achieved biodiversity benefits in 1-10 years of implementation; however these claims are based primarily on increases in the area reforested or in the forest conserved, rather than on concrete comparisons of current biodiversity levels to an initial baseline. It is likely that the 6 REDD projects will indeed have significant positive biodiversity outcomes due to the large areas of native forest (range of 30,166 to 1,351,963 ha) they will protect, as long as actions to reduce specific threats to biodiversity and displacement of threats are included. However, quantitative data to demonstrate these benefits are lacking, and it is unclear whether the proposed monitoring plans are sufficient to demonstrate benefits over the long term. The biodiversity benefits of the reforested areas are much less evident and likely to vary greatly across the 11 projects studied, due to the variation in the types of plantations established (in particular, their use of native tree species), the size of the plantation and the plantation's location within the broader landscape. More detailed and comprehensive monitoring of plant and animal species using the reforested areas is necessary to gauge the extent to which these projects will deliver biodiversity benefits.

This review highlights the need to be more explicit about the biodiversity goals of forest carbon projects, to seek opportunities to link these goals with national biodiversity objectives and to implement monitoring plans that allow more precise evaluations of the impacts on biodiversity. We recognize that not all projects will prioritize biodiversity benefits and that project proponents and policy makers must weigh the costs and benefits of implementing additional biodiversity-specific actions in their projects. However, improvements in forest carbon project design and monitoring plans could ensure better outcomes for biodiversity, while also providing greater resilience and sustainability for the carbon stocks that the projects aim to conserve. Greater biodiversity impacts could also help to attract investments.

Specific recommendations for enhancing the biodiversity benefits from forest carbon projects include:

1. Integrate planning for biodiversity conservation into the project at the time of project design;
2. Explicitly consider potential biodiversity benefits when prioritizing sites for REDD+ projects, selecting sites that have high biodiversity value and are aligned with national biodiversity priorities, including those described in NBSAPs and national REDD+ strategies;
3. In A/R projects, maximize potential biodiversity benefits by creating structurally and floristically diverse plantations of native species, locating plantations on degraded lands, and avoiding the use of invasive species or species that could alter hydrological regimes;
4. Identify threats to biodiversity and consider how these may differ from threats to carbon stocks (both spatially and temporally), and design specific actions to address these threats;
5. Clearly describe the expected without-project outcomes for biodiversity (analogous to the emissions baseline) and use quantitative projections of the status of the biodiversity targets to allow for clear comparisons with the biodiversity monitoring results.;
6. Be explicit about what the expected biodiversity benefits of the project are and how these benefits will be obtained;
7. Include local people in the design and implementation of biodiversity monitoring and take advantage of traditional ecological knowledge, where possible.
8. Include monitoring methods that are compatible with the monitoring being used for national biodiversity monitoring initiatives, such as those being conducted for national reports to the Convention on Biological Diversity (CBD) and for REDD+ safeguards;
9. Include indicators of pressure (threats to biodiversity), state (status of the forest and populations of target species), and response (actions taken by the project), including indicators that signal potential negative impacts;

10. Plan biodiversity-specific monitoring to measure progress, including indicators of planned activities being implemented as well as indicators that show longer-term outcomes and impacts on biodiversity; and
11. Establish a clear, systematic and regular process for reviewing the results from biodiversity monitoring and adapting project activities as needed, to ensure biodiversity benefits are achieved.

1.0 INTRODUCTION

The loss of tropical forest is a major threat to biodiversity. In recent years, tropical deforestation has also become known as a major source of greenhouse gas (GHG) emissions, representing between 6 and 17 percent of all anthropogenic emissions (Baccini et al. 2012, Harris et al. 2012). The necessity of mitigating emissions from forests, combined with the potential for conserving biodiversity and producing other benefits, has made forest conservation an important part of global efforts to combat climate change.

These efforts are focused on the development of REDD+[1], a policy framework being negotiated under the United Nations Framework Convention on Climate Change (UNFCCC) as a way to reduce GHG emissions and promote increased storage of carbon in forests. This mechanism would compensate developing countries for reducing GHG emissions from forests and would provide incentives for increasing the amount of carbon stored in a country's forests.

While REDD+ is primarily being developed to mitigate climate change, it has received significant support from the biodiversity conservation community because of its potential to protect or restore biodiversity-rich tropical forests at the scale of whole countries. Depending on how it is implemented, REDD+ could help maintain large tracts of threatened forests, reduce forest degradation, and also enhance the overall connectivity of forest cover across altitudinal gradients or biological corridors, facilitating plant dispersal and animal movement (Harvey et al. 2010, CBD 2011). Other benefits to biodiversity from REDD+ could include improved forest governance for more sustainable management of tropical forests, including reduced levels of illegal logging and hunting (Dickson and Kapos 2012).

However, REDD+ is not without risks for biodiversity. If designed poorly, outcomes for biodiversity could be negative. One frequently cited concern is that REDD+ could incentivize the replacement of low-carbon, highly biodiverse habitats with high-carbon, low-biodiversity plantations (Harvey et al. 2010). Another important risk is that the protection of high-carbon forest in one area could lead to the displacement of threats to other more biodiverse forests in other areas (Harvey et al. 2010, Harrison et al. 2012). Similarly, the protection of high carbon forests could lead to the conversion of other habitats like grasslands or savannas with high biodiversity value (Harvey et al. 2010, Christophersen 2010). Incentives for new forest or biofuel plantations could lead to afforestation of non-forested lands (Christophersen 2010, Gardner et al. 2012), and, depending on their design and management, forest plantations could lead to the introduction of exotic species or negatively impact key ecosystem functions, such as fire or hydrological regulation (Lindenmayer et al. 2012).

What determines the potential risks or opportunities for biodiversity conservation? Harvey et al. (2010) indicate that the impacts of REDD+ on biodiversity conservation will depend both on the design of REDD+ policies, as well as their implementation. Dickson and Kapos (2012) identify three factors that determine potential risks or opportunities for biodiversity conservation through REDD+: i)which of the five REDD+ activities are implemented; ii) where REDD+ is implemented (biodiversity is unevenly distributed among forests so some forests are of greater biodiversity significance than others); and iii) which interventions are used to implement REDD+. Because biodiversity and carbon are unevenly distributed across the world's forests, the impacts of REDD+ on global biodiversity will depend significantly on where

[1] A mechanism for reducing emissions from deforestation and forest degradation, plus the role of conservation, the sustainable management of forests and the enhancement of forest carbon stocks

REDD+ is implemented, and this will depend on fine scale spatial relationships between deforestation, carbon stocks, and species distributions (Strasburg et al. 2012).

Biodiversity is not only affected by REDD+, but is also important for the success of REDD+. There is evidence that the long-term ability of forests to store carbon depends on the diversity of the species present in the forest. Diverse native forests may be more resistant to disease, drought and other disturbances, and also more resilient, with the ability to recover more rapidly from disturbances, thereby recapturing emissions (Thompson et al. 2009, Christophersen 2010). Consequently, the conservation of forest biodiversity is likely important for the long-term maintenance of forest carbon stocks.

While a global REDD+ mechanism is still being constructed and detailed policies for its implementation are still in development, a rapidly growing number of smaller scale forest carbon projects are already being implemented. The number of projects has expanded in the last five years (Peters-Stanley et al. 2013), at least partially in response to the UNFCCC decision in Bali in 2007 that encouraged countries to initiate REDD+ demonstration activities. These forest carbon projects apply the same basic concepts that underlie the REDD+ mechanism developed under the UNFCCC. They are designed to generate income as compensation for avoiding deforestation or forest degradation, or for increasing forest carbon stocks, for example through reforestation. Similarly to REDD+ under the UNFCCC, these projects often apply safeguards or standards to promote acceptable levels of social and environmental performance.

A majority of forest carbon projects are applying standards, such as the Climate, Community and Biodiversity (CCB) standards (CCBA 2008) and Plan Vivo (Plan Vivo Foundation 2008), which require positive biodiversity impacts (Peters-Stanley et al. 2013). These standards require a high degree of transparency, including online posting of project design documents and reporting on project implementation, which provides an important and readily available source of information about how early forest carbon projects approach biodiversity conservation. The growing body of experience with forest carbon projects provides an important opportunity to empirically understand the links between REDD+ and biodiversity conservation, to assess how the design and implementation of REDD+ can affect biodiversity outcomes, and to generate information that can be used to design REDD+ policies that lead to positive outcomes for biodiversity.

This report is a review of how forest carbon projects (both afforestation/reforestation [A/R] and avoided deforestation projects) have addressed biodiversity issues in their design, implementation and monitoring. In this review, we address four main questions:

1. What types of biodiversity benefits do forest carbon projects seek to provide and what actions are being undertaken to achieve these?
2. Are project activities designed to support national biodiversity objectives?
3. Are project monitoring methods appropriate to biodiversity goals, and do they include ways to identify and measure potential negative impacts on biodiversity? and
4. What early evidence exists that forest carbon projects are delivering biodiversity benefits?

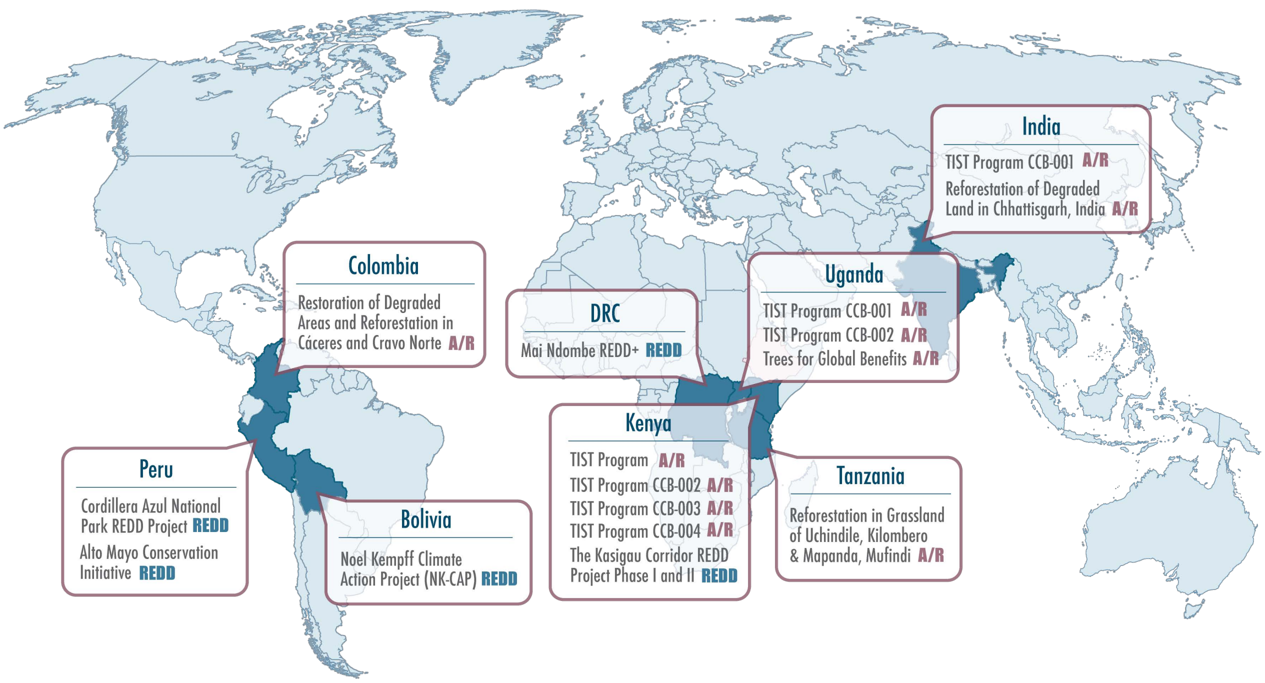
This report is organized around the above questions and also provides recommendations for how REDD+ policies and standards could better incorporate concerns for achieving and documenting biodiversity benefits.

2.0 METHODS

This study was done through a desk review of publically available documents from 17 forest carbon projects in eight developing countries. The projects were selected because they all have goals of generating social and environmental benefits in addition to emissions reductions or removals and are among the most advanced projects (all are in implementation). In addition, all of these projects have made project documents publicly available. In most cases this includes descriptions of the project design, biodiversity goals, actions to conserve biodiversity, monitoring methods, and monitoring results.

The sample includes ten projects from Eastern Africa, one project from Central Africa, four projects from South America; and two projects from South Asia (India). The majority of projects that were reviewed (11 of 17) are reforestation projects that seek to sequester carbon dioxide (CO_2) from the atmosphere through tree planting (hereafter referred to as A/R projects). The remaining projects (6 of 17) are designed to protect existing forest, thereby reducing the emissions that are caused by deforestation or forest degradation (hereafter referred to as REDD[2] projects). See figure 1. Additional details about these projects are presented in Table 1.

Figure 1: Location of projects reviewed



[2] REDD (without the +) is used throughout this report to refer to projects that seek to reduce GHG emissions associated with deforestation or forest degradation.

Table 1: Characteristics of the 17 forest carbon projects reviewed for this study, including project name, abbreviated name (used throughout the rest of the document), and the type of project (A/R versus REDD). Carbon accounting methodologies that begin with CDM have been approved for use in the Clean Development Mechanism and are accepted by the Verified Carbon Standard (VCS); those that start with VCS have been developed for and approved by the VCS.

Project Name	Short name	Start Year	Type	Project size (ha)	Carbon accounting methodology	Status with carbon accounting standards	Status with multiple benefit standards
TIST Program in Kenya	TKEN1	2004	A/R	1,565	CDM AR-AMS0001 Version 05	VCS registered, credits issued	Validation and Verification Approved Gold Level for exceptional community benefits - CCB Standards 2nd Edition (Mar 9, 12)
TIST Program in Kenya CCB-002	TKEN2	2004	A/R	2,556	CDM AR-AMS0001	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition Gold Level for exceptional community benefits (Dec 16, 11)
TIST Program in Kenya CCB-003	TKEN3	2004	A/R	7,419	CDM AR-AMS0001 Version 06	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition Gold Level for exceptional community benefits (Sept 28, 12)
TIST Program in Kenya CCB-004	TKEN4	2004	A/R	2,724	CDM AR-AMS0001 Version 06	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition Gold Level for exceptional community benefits (Mar 11, 2013)
TIST Program in Uganda CCB-001	TUGA1	2003	A/R	1,488	CDM AR-AMS0001 Version 07	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition Gold Level for exceptional community benefits (May 11, 12)
TIST Program in Uganda CCB-002	TUGA2	2003	A/R	1,160	CDM AR-AMS0001 Version 06	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition Gold Level for exceptional community benefits (Mar 12, 2013)
TIST Program in India CCB-001	TIND1	2004	A/R	672	CDM AR-AMS0001, Version 06	VCS registered, credits issued	Validation and Verification Approved - CCB Standards 2nd Edition (Mar 11, 2013)
Restoration of Degraded Areas and Reforestation in Cáceres and Cravo Norte, Colombia	CACRAV	2002	A/R	10,870	CDM AR-AM0005	VCS registered, credits issued	Validation Approved - CCB Standards 2nd Edition (Jun 15, 2011); Verification Approved - CCB Standards Second Edition (Oct 25, 2011)
Trees for Global Benefits, Uganda	TGB	2003	A/R	5,000	Plan Vivo	Plan Vivo registered, credits issued	Plan Vivo Validated and Verified

Reforestation in Grassland of Uchindile, Kilombero, Tanzania & Mapanda, Mufindi, Tanzania	UCHMAP	1997	A/R	12,905	CDM AR-AM0005, version 03	VCS registered, credits issued	Undergoing Validation and Verification CCB Standards 2nd Edition; Validation Approved - CCB Standards First Edition Silver Level (Oct 16, 09)
Reforestation of Degraded Land in Chhattisgarh, India	CHHAT	2002	A/R	282	CDM AR-AM0001 version 02,	VCS registered, credits issued	Undergoing Validation and Verification CCB Standards 2nd Edition; Validation Approved - CCB Standards First Edition Gold Level (Jun 23, 09)
Cordillera Azul National Park REDD Project, Peru	CORAZU	2008	REDD	1,351,964	VCS VM0007	VCS registered, credits issued	Validation Approved - CCB Standards Second Edition Gold Level for exceptional biodiversity benefits (Feb 19, 2013); Undergoing Verification
The Kasigau Corridor REDD Project Phase I – The Rukinga Sanctuary, Kenya	KASPH1	2006	REDD	30,166	VCS VM0009	VCS registered, credits issued	Validation and Verification Approved - CCB Standards Second Edition Gold Level for exceptional biodiversity benefits (Dec 05, 2012)
The Kasigau Corridor REDD Project, Phase II, Kenya	KASPH2	2010	REDD	169,741	VCS VM0009	VCS registered, credits issued	Validation and Verification Approved - CCB Standards Second Edition Gold Level for exceptional biodiversity benefits (May 23, 2013)
Mai Ndombe REDD+, Dem. Repub. Of Congo	MAINDO	2011	REDD	299,645	VCS VM0009, version 2.0	VCS registered, credits issued	Validation and Verification Approved - CCB Standards Second Edition Gold Level for exceptional biodiversity benefits (Dec 6, 2012)
Noel Kempff Climate Action Project (NK-CAP), Bolivia	NKCAP	1997	REDD	642,458	Project-specific methodology	Independently verified, no carbon accounting standard used	Emissions reductions independently verified, no multiple benefit standard used
Alto Mayo Conservation Initiative, Peru	ALTMAY	2008	REDD	182,000	VCS VM0015	VCS registered, credits issued	Validation and Verification Approved - CCB Standards Second Edition Gold Level for exception biodiversity benefits(Dec 12, 2012)

Fifteen of the projects in this sample had initiated or completed the verification process against the CCB Standards (CCBA 2008) as of August 1, 2013. These standards are the most widely used multiple benefit standards for forest carbon projects (Peters-Stanley et al. 2013). CCB Standards Verification is an evaluation by an independent auditor of whether a project has been implemented in a way that conforms to the CCB Standards, including whether the project has delivered net-positive biodiversity benefits. The CCB Standards Second Edition (the version currently in use) also includes an optional Gold Level certification for projects that provide exceptional biodiversity, community or climate change adaptation benefits. The Biodiversity Gold Level requires the conservation of sites with global biodiversity significance, for example sites with IUCN Red-List species that have been designated as Critically Endangered, Endangered or Vulnerable.

In addition to 15 projects that used the CCB Standards, the sample also includes the NKCAP Project as an example of one of the earliest REDD projects. The NKCAP was developed in the 1990's prior to the existence of biodiversity standards for REDD+. This project underwent review by third-party auditors, though that review was limited to an assessment of the emissions reductions that were claimed by the project and was not an evaluation of biodiversity performance.

The final project reviewed was the TGB project from Uganda. This project was selected as an example of a project that uses the Plan Vivo Standard (Plan Vivo Foundation 2008). The Plan Vivo Standard was designed to promote more sustainable land management in a way that delivers climate, livelihood and ecosystem benefits and is designed specifically for use on smallholder and community lands. The "Plan Vivo" is a land management plan generated by a group of rural researchers in Chiapas, Mexico through a participatory process in 1994-1997. Lessons were learned from a decade of implementation in Mexico, and the certification program was scaled up for global application in 2009. The proposed plans must be reviewed by a project coordinator for compliance with standards, and the coordinator subsequently develops annual reports about the implementation of Plan Vivo project plans. Plan Vivo projects must be evaluated by independent party auditors to determine if they are being implemented in a way that meets the requirements of the standard.

The CCB Standards and Plan Vivo Standard are multiple benefit standards, designed to generate social and environmental benefits in addition to emissions reductions or removals. The emphasis on social and environmental performance distinguishes these standards from the widely used Verified Carbon Standard (VCS). Table 2 provides an overview of the requirements of the CCB, VCS and Plan Vivo standards in regards to environmental performance.

Table 2: An overview of the biodiversity-related criteria in the VCS, CCB and Plan Vivo Standards

Standard	Environmental Requirement	Permits conversion of native ecosystems?	Ex-ante assessment of biodiversity impacts required?	Ex-post/ongoing monitoring required?	Required method for measuring any biodiversity benefits
VCS AFOLU Requirements Version 3.3	Avoid harm	No	Yes	Not explicitly required, but would be needed to satisfy requirement that negative impacts are being mitigated	Not applicable
Climate, Community and Biodiversity (CCB) Standards 2nd Edition	Positive Impact	Not if HCV[3]. Conversion of native ecosystems would have to be justified	Yes	Yes	Measured biodiversity conditions must be compared against a without-project scenario
Plan Vivo Standards 2008	Positive Impact	Not explicitly prohibited, though wider ecological impacts must be described	Yes	Not explicitly required, but would be needed to show that positive environmental impacts have been achieved	Not specified

Data was collected by reviewing publically available project documents[4]. A template was used to compile the information collected from the review of project documents in a standardized way. General project characteristics, including location, type, and size, were recorded. A typology of threats to species that was developed by Salafsky *et al.* (2008) and later adopted by the International Union for Conservation of Nature (IUCN) (IUCN CMP 2012a) was used to categorize the threats identified in the project design documents. The biodiversity goals of the project were also summarized, as well as any information that described how the biodiversity goals were selected and whether these were explicitly selected in relation to national biodiversity conservation priorities. The types of interventions planned by the project were classified using Version 2.0 of the IUCN typology of conservation actions (IUCN CMP 2012b). In addition, the project biodiversity monitoring methods and the results of that monitoring were also summarized.

After the data were compiled for each project, the recorded information was sent to the contact person listed in the project design document to provide an opportunity for the project proponent to correct inaccuracies. Only two of the 17 project proponents provided detailed replies to requests for raw data. Feedback from these project proponents (TIST and NKCAP) highlighted the fact that the documents reviewed for this study may not provide a complete picture of all of the actions that the projects are implementing to conserve biodiversity or the monitoring methods that are being applied.

This review was limited to documents that were posted on the websites of the CCB Standards and Plan Vivo Standards (except for the NKCAP project which did not apply a multiple-benefit standard). The project documents were developed to address the requirements of the standards and may therefore omit information that was not needed for certification but is relevant for this study. For example, the developer of the TIST

[3] High Conservation Value. Guidance on applying the HCV approach is available at http://www.hcvnetwork.org/.

[4] CCB Standards project documents downloaded from: http://www.climate-standards.org/projects; NKCAP documents downloaded from http://www.conserveonline.org; Plan Vivo project documents downloaded from http://www.planvivo.org/projects/.

projects explained that the projects initiated in Kenya responsed to USAID's recognized need to address biodiversity loss and that additional activities relevant to biodiversity are being implemented, but were not described in the documents submitted to the CCB Standards. The developer of NKCAP made a similar observation that indicated that the project design document does not describe all of the project's actions related to biodiversity. The projects that did not reply to our messages may also be implementing other biodiversity-related activities. To make the results more comparable, this review was limited to the documents that were made publicly available as part of the certification process against the multiple benefit standards. In the case of NKCAP, which did not use a multiple benefit standard, the review was limited to information that was publicly available through a website operated by the project proponent

3.0 RESULTS

3.1 BIODIVERSITY OBJECTIVES AND ACTIONS TO ENHANCE BIODIVERSITY

All 17 forest carbon projects described biodiversity objectives, though the level of detail in which these biodiversity objectives were described varied across projects. The 11 A/R projects sought to achieve a range of biodiversity benefits, including provision of habitat through planting native tree species, improved connectivity of forest fragments and reduced pressure on nearby native forest (Table 3). The CHATT project, for example, described the role of planted trees in providing habitat for bird species that would not be found in the highly degraded lands that existed before the plantation was established. The seven TIST projects all indicated that the plantations reduce pressure on forests by providing fuel wood and timber for local communities, and also improve landscape connectivity for wildlife. The UCHMAP project differed from the others in that the plantations were not expected to provide direct benefits for biodiversity. Instead, this project was designed to use the sale of carbon credits generated with non-native species to fund the conservation management of nearby native forest that is habitat for several threatened species of animals, including a vulnerable tree species, a vulnerable bird species and an endangered mammal species. This was the only A/R project with explicit goals to protect vulnerable or endangered species.

The A/R projects varied significantly in their use of native tree species, ranging from 100 percent exotics (UCHMAP) to 100 percent native species (CHHAT; Table 3). In five A/R projects, native trees represented less than 10 percent of the stems or area planted. Justifications for the use of exotic species included their value as fruit trees, their use in construction by local people, their value for commercial timber, and their high growth rates. These benefits were described as ways to reduce pressure on nearby native forest.

Table 3: Summary of the biodiversity goals (including whether the project seeks to protect species that have been identified by the IUCN Red List as vulnerable, endangered, or critically endangered), potential negative biodiversity impacts off site, and use of native trees in the 11 A/R projects reviewed.

	Biodiversity goals						
Project name	Plant trees, including native species	Reduce pressure on natural forest or natural resources	Improve connectivity for wildlife	Restore habitat for other native species	Explicit goal of conserving Red List species?	Potential negative offsite biodiversity impacts expected?	% of trees planted that are native species*
TKEN1 Kenya	x	x	x		No	No	8.1
TKEN2 Kenya	x	x	x		No	No	6.9
TKEN3 Kenya	x	x	x		No	No	12.6
TKEN4 Kenya	x	x	x		No	No	12.1
TUGA1 Uganda	x	x	x		No	No	0.4
TUGA2 Uganda	x	x	x		No	No	0.3
TIND1 India	x	x	x		No	No	91.2
CACRAV Colombia	x			x	No	No	97.2
TGB Uganda	x	x			No	(not described)	(not available)
UCHMAP Tanzania		x			Yes	Yes	0
CCHAT India	x	x			No	No	100

*The percentage of trees planted that are native species is based on the number of stems, with the exception of TUGA1 and TUGA2 which did not present this information in project documents. For these projects, the percentage reflects the number of hectares planted with native species, divided by the total number of hectares in the project.

Each of the six REDD projects planned to conserve native forest with high biodiversity value and/or prevent further deforestation or forest degradation (Table 4). The biodiversity goals of some of these projects also included preventing illegal hunting and fishing, maintenance of wildlife corridors, protection of threatened species, and, in one case, the expansion of a national park. Five of the REDD projects indicated that the project area contains species that are considered "Threatened" in the IUCN classification system. For example, the MAINDO project is home to bonobos which are classified as Endangered.

Each of the six REDD projects planned activities that are consistent with achieving their biodiversity goals. All planned to address the loss of habitat through the same activities that they are using to reduce emissions from deforestation and/or degradation. These included alternative livelihood activities such as the application of improved agricultural techniques designed to increase yield and reduce demand for land (practiced by all of the REDD projects). In addition, each of the REDD projects planned to implement a patrol system to detect and deter illegal activities like logging, hunting, and fishing within the project areas, thereby reducing threats to biodiversity.

Table 4: Summary of the biodiversity goals (including whether the project seeks to protect species that have been identified by the IUCN Red List as vulnerable, endangered, or critically endangered and potential negative offsite biodiversity impacts of the six reviewed REDD projects.

Project	Biodiversity goals							Explicit goal of conserving CR, EN and VU species?	Potential negative offsite biodiversity impacts expected?
	Prevent habitat loss	Prevent forest degradation	Prevent illegal logging	Prevent illegal hunting and fishing	Protect a wildlife corridor	Protect endangered species	Expand national park		
CORAZU Peru	x		x	x		x		Yes (4 CR, 4 EN, 13 VU)	No
KASPH1 Kenya	x			x	x	x		Yes-5 spp of mammals (2 EN, 3 VU)	No
KASPH2 Kenya	x			x	x	x		Yes- 5 spp of mammals (2 EN, 3 VU)	No
MAINDO DRC	x	x	x	x		x		Yes, 7 spp of plants (2 En, 5 VU); 1 mammal (EN)	No
NKCAP Bolivia	x	x				x	x	Yes, though a list of species by red list status not included	(Not described)
ALTMAY Peru	x		x	x		x		Yes- 1 spp of plants (5 VU); 12 mammals (1 CR, 2 EN, 9 VU); 9 spp birds (5 EN, 4 VU); 2 amphibians (1 CR, 1 EN)	Yes- risk of leakage of deforestation and illegal extraction of flora and fauna

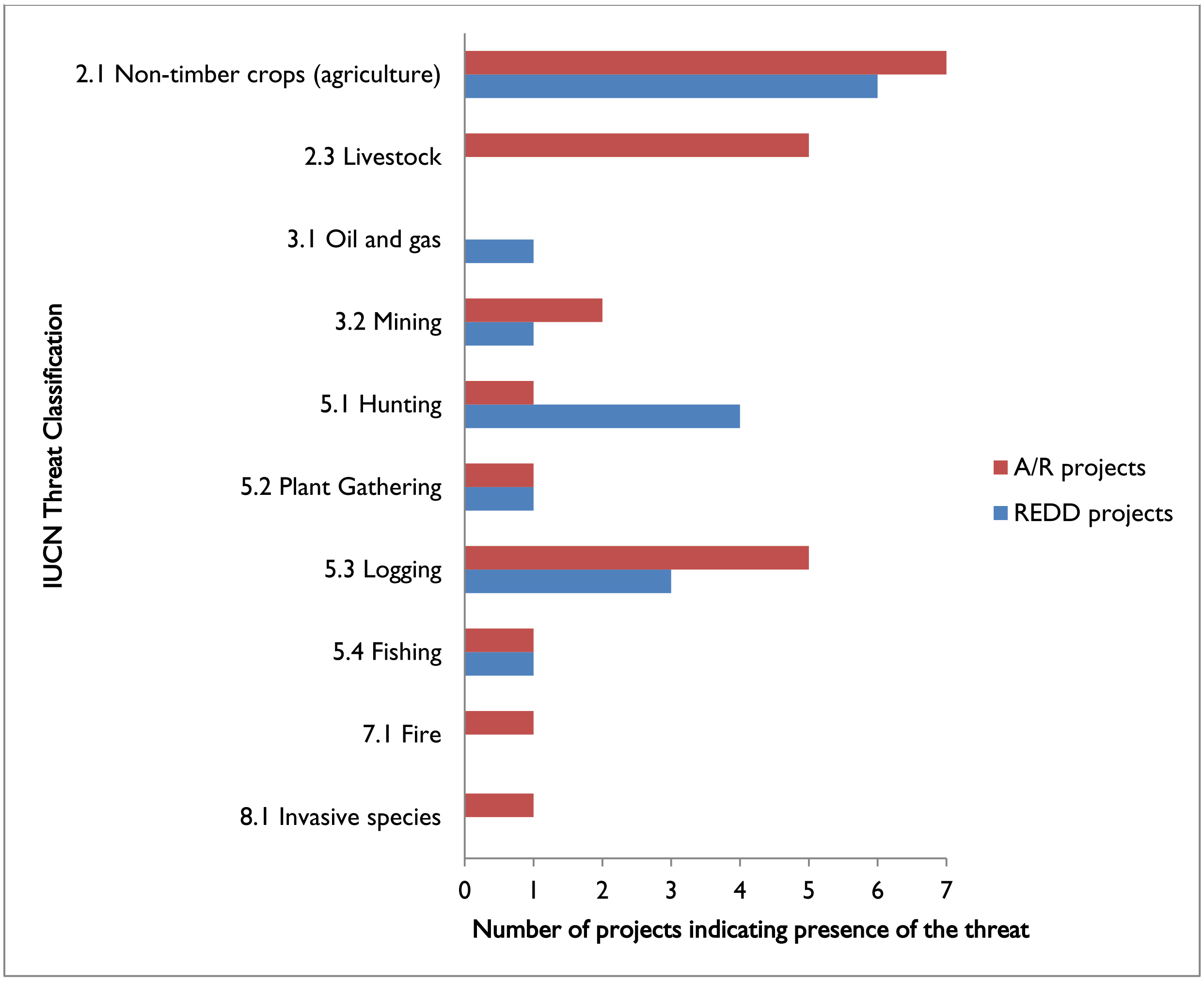
Only two of the 17 forest carbon projects reviewed indicated that there could be negative impacts on biodiversity outside of the project area. This "leakage" of biodiversity impacts is analogous to the leakage of emissions, where project activities displace negative biodiversity impacts to areas beyond the project boundaries. The UCHMAP (A/R) project listed several possible negative offsite impacts, including the depletion of soil nutrients, the alteration of biological processes due to change of land use, decrease of water levels, threats to riverine and valley vegetation, spread of tree diseases and spread of fungal flora. The project document stated that these potential impacts will be monitored and mitigated. The ALTMAY (REDD) project indicated that project activities could lead to the displacement of deforestation and the illegal extraction of flora and fauna. The project planned to mitigate these risks through intensified agricultural practices that reduce the need for farmers to clear more forest, and planned to conduct biodiversity monitoring in areas beyond the project boundaries to determine if leakage of biodiversity impacts is occurring.

3.2 THREATS

The threats to biodiversity that were described by all 11 A/R projects referred to general threats in the project region, and not specifically to biodiversity in the areas that were to be reforested. The regional threats that were described include agricultural expansion, livestock, unsustainable fishing and hunting, logging, fire, and invasive species. There was no description of biodiversity threats to the areas that were planned for reforestation. All of the projects described those areas as degraded and they did not present details about remaining biodiversity on the degraded areas.

Among the REDD projects, five of the six (CORAZU, KASPH1, KASPH2, MAINDO and ALTMAY) explicitly described threats to biodiversity within the project area. The NKCAP only described threats to the forest in the context of the effect on emissions; the threats to biodiversity were not explicitly indicated, though a threat to biodiversity can be inferred based on the fact that a main goal of the project is the expansion of a highly diverse national park. All six of the REDD projects described agricultural expansion (listed as Non-timber Crops in the IUCN classification scheme) as a threat. Four of the projects also identified hunting as a threat to biodiversity and three of the six projects cited logging as a threat. Threats from oil and gas drilling and mining (CORDAZU) and gathering terrestrial plants and fishing (MAINDO) were each cited as threats by only one project. Figure 1 shows the number of projects that cited each of the different types of threats.

Figure 2: The threats to biodiversity cited by the forest carbon projects (n=17 projects, including 11 A/R and 6 REDD projects). Many projects cited more than one threat. In the case of the A/R projects, the threats refer to areas outside of the project area. For REDD projects, the threats refer to the project area itself.



3.3 CONTRIBUTIONS OF FOREST CARBON PROJECTS TO NATIONAL BIODIVERSITY OBJECTIVES

Forest carbon projects have the potential to contribute to achieving national biodiversity objectives, including the commitments that countries make to the United Nations Convention on Biological Diversity (CBD). Each of the eight countries represented by the projects reviewed for this study has ratified the CBD and has developed national biodiversity strategies and action plans (NBSAPs). However, none of the projects made explicit reference to NBSAPs or other national biodiversity goals. There was, however, implicit support for national biodiversity objectives in the projects that were designed to support aspects of the national protected areas system. The TGB project, for example, stated that "The project targets communities that are neighboring with protected areas and plans are underway to extend the project to other areas of ecological importance within Uganda." Three of the six REDD projects (CORAZU, NKCAP, ALTMAY) were designed to bolster protection and ensure the financial sustainability of national protected areas. Two of the others (KASPH1, KAPH2) are adjacent to national protected areas and were explicitly described as supporting those areas.

3.4 MONITORING OF BIODIVERSITY IN FOREST CARBON PROJECTS

The methods used for monitoring the biodiversity impacts of the projects ranged from simple measures of the number of trees or area reforested to more comprehensive sets of methods that include monitoring of populations of species of high conservation value. An overview of the monitoring methods used by the 17 reviewed projects is presented in Table 5.

3.4.1 Monitoring in afforestation/reforestation projects

The biodiversity monitoring plans of most of the A/R projects focused primarily on measuring the area or number of trees planted. For example, the seven TIST A/R projects based their biodiversity monitoring on the number and species of native trees planted, the area (ha) covered by these trees and the number of hectares planted with native species in riparian areas. These projects included the goals of improving connectivity between existing forests and reducing pressure on native forest, but the monitoring did not include methods to evaluate whether connectivity has increased or whether the pressure is being reduced. Similar to the TIST projects, the TGB project monitors tree establishment and did not describe the use of other biodiversity indicators.

The other A/R projects also had monitoring plans that include monitoring the trees planted, as well as a limited number of other indicators. The CACRAV project planned to record wildlife sightings, and indicated that plots were established for conducting inventories of flora. The method for monitoring wildlife was not described in detail, but appeared to be based on observations made by project staff in the course of doing other duties, rather than a systematic sampling program. Details about the design of vegetation plots were not provided.

The main biodiversity goal of the CHHAT A/R project was to establish native trees on severely degraded lands. In addition to monitoring tree establishment, the CHHAT project described a plan for monitoring biodiversity that included several indicators with limited value for assessing changes in biodiversity. These included tree form maintenance and the monitoring of Nilgai, an ungulate that is known to damage crops outside of the forest plantation. The plan included monitoring canopy cover and the use of fire in the plantation. These could have implications for biodiversity, though these indicators are not direct measures of biodiversity. The Project Implementation Report indicated that a complete biodiversity survey will be carried out, but no details on methods nor results were provided, so it is not possible to characterize this survey.

The biodiversity objective of the UCHMAP (A/R) project was to reduce pressure on natural forest. The biodiversity monitoring plan described several methods, though insufficient details were provided to assess their effectiveness. The methods included satellite monitoring of vegetation cover and ground-based monitoring. Surveys of flora and fauna using line transects and sample plots were also planned. The monitoring plan did not provide details regarding the sampling intensity nor the target species to be monitored with these methods. There were separate mentions of the use of line transects to monitor endangered blue swallows, and the observation of animal droppings to monitor endangered mammals like Abbot's duiker. Details about the sampling intensity were also not provided for monitoring these animals. Other sampling methods included line transects for invasive plant species to be conducted every three years and twice yearly monitoring of water quantity and quality. Soil quality was planned to be monitored every five years.

All of the A/R projects based their monitoring on field methods. In addition, three A/R projects also used remote sensing data to measure the area reforested. Two of the A/R projects (CACRAV and UCHMAP) planned field based monitoring methods that are likely to require expertise that is not found within the communities near the project. These included plot and transect-based inventories of plants and animals.

To assess project impacts on biodiversity, the results of monitoring must be compared to a without-project scenario (counterfactual). All but one of the A/R projects provided a qualitative description of the likely without-project biodiversity conditions, indicating that without the project, the degraded conditions will continue. However, there were no specific descriptions presented about the status of biodiversity on the degraded lands.

3.4.2 Biodiversity monitoring in REDD projects

The five REDD projects that use the CCB Standards all provided a more detailed biodiversity monitoring plan than the A/R projects. The NKCAP project, which was developed prior to the existence of the CCB Standards, did not include biodiversity monitoring in the Project Design Document (PDD); instead, it indicated that the Noel Kempff National Park management conducts its own biodiversity monitoring as part of the park's management plan.

For each of the CCB REDD projects, biodiversity monitoring included satellite-based tracking of forest cover. The ALTMAY project provided greater detail about this monitoring than the other projects, and included plans to monitor habitats within the project zone that are known to house high conservation value species, and to also monitor the degree of forest fragmentation.

All five of the CCB Standards REDD projects also included provisions for monitoring wildlife directly. This included monitoring of bonobos (MAINDO), yellow tail wooly monkeys (ALTMAY), species threatened by hunting (CORAZU) and other unspecified wildlife (KASPH1, KASPH2). The bonobo monitoring was planned to be done every five years, while the yellow tailed wooly monkey monitoring was planned to be done three times per year, using transects and interviews with local residents. For the CORAZU, KASPH1 and KASPH2 projects, monitoring is based on logs of wildlife encounters by rangers or project staff.

The projects also used a variety of indirect measures of biodiversity. Four of the six REDD projects planned to monitor threats to biodiversity by tracking the number of poaching incidents registered by project staff (CORAZU, KASPH1, KASPH2, ALTMAY). The ALTMAY and MAINDO projects included monitoring of the management practices that are designed to reduce pressures on the forest, like improved agricultural practices, efficient cook stoves, and environmental education.

As with the A/R projects, the REDD projects that described a without-project scenario for biodiversity did so qualitatively. Though they are implementing species-specific monitoring that could allow tracking of the populations of these species, they did not provide a quantitative estimate of how these populations would be likely to change if the REDD project were not implemented. The qualitative descriptions indicated that the species populations would decline in the absence of project activities.

Table 5: Characteristics of the biodiversity monitoring plans of the projects reviewed, including information on how the without-project scenario was created, what types of methods are used, which indicators are monitored and whether monitoring requires experts.

	Project	Type of without-project scenario for biodiversity	Remote sensing methods used?	Field-based methods used?	Biodiversity indicators monitored	Field monitoring requires expert?
A/R projects	TKEN1 Kenya	Qualitative	No	Yes	Total hectares planted; Number of trees planted by species; Number and area of native trees by species and age; Hectares planted with native trees in riparian areas	No
	TKEN2 Kenya	Qualitative	No	Yes	Total hectares of the project; Number of tree by species; Number and area of native trees by species; species and age; Hectares of improved riparian areas	No
	TKEN3 Kenya	Qualitative	No	Yes	Total hectares of the project; Number of trees by species; Number and area of native trees by species; species and age; Hectares of improved riparian areas	No
	TKEN4 Kenya	Qualitative	No	Yes	Total hectares of the project; Number of trees by species; Number and area of native trees by species; species and age; Hectares of improved riparian areas	No
	TUGA1 Uganda	Qualitative	No	Yes	Total hectares of the project; Number of trees by species; Number and area of native trees by species; species and age	No
	TUGA2 Uganda	Qualitative	No	Yes	Total hectares of the project; Number of trees by species; Number and area of native trees by species; species and age	No
	TIND1 India	Qualitative	No	Yes	Total hectares of the project; Number of trees by species; Number and area of native trees by species; species and age	No
	CACRAV Colombia	Qualitative	Yes	Yes	Wildlife sightings; Forest cover, Plots for inventories of flora	Yes
	TGB Uganda	None	No	Yes	Tree establishment and growth	No
	UCHMAP Tanzania	Qualitative	Yes	Yes	Habitat cover, Flora and fauna surveys	Yes
	CHHAT India	Qualitative	No	Yes	Canopy structure; Fire frequency	No
REDD projects	CORAZU Peru	Qualitative	Yes	Yes	Habitat cover; Presence and abundance of hunted species; Numbers of introduced species; Numbers of illegal hunters and loggers	No
	KASPH1 Kenya	Qualitative	Yes	Yes	Wildlife observations; Number of poaching incidents observed during patrols; Area reforested; Number of native trees established	No
	KASPH2 Kenya	Qualitative	Yes	Yes	Wildlife observations; Number of poaching incidents; Area reforested; Number of native trees established	Yes
	MAINDO DRC	Qualitative	Yes	Yes	Area and status of native forest and/or natural vegetation in the project area; Population size of bonobos; Frequency or intensity of logging, hunting, agriculture conversion, fires	Yes
	NKCAP Bolivia	None	n/a*	n/a	n/a	
	ALTMAY Peru	Qualitative	Yes	Yes	Forest cover; fragmentation; Primate monitoring; Ha reforested with native spp.; Illegal extraction of spp.	Yes

3.5 BIODIVERSITY RESULTS

With the exception of the NKCAP project, for which the biodiversity monitoring plan and results were not available, and the TBG project, which did not make specific claims about biodiversity in its annual report, all of the projects indicated that biodiversity benefits had been achieved (Table 6). The other nine A/R projects that are using native species all documented the number of hectares that were planted or the number of individuals of these species and explained that this increase in native tree cover has positive benefits for biodiversity, providing both improved habitat and greater landscape connectivity. The TIST projects and CHHAT project are examples of this, and simply presented the number of individuals of native species planted and the number of hectares that these trees cover.

The CACRAV project stated that the biodiversity monitoring plots within the reforestation area were applied and presents sample data sheets with species lists. However, it did not summarize the results of this monitoring and compare it to baseline data. The verification report stated that the project delivered biodiversity benefits through planting native trees on pasture land. Monitoring of other plant and animal species does not appear to have been part of the verification assessment.

The UCHMAP project, which seeks to produce biodiversity benefits in the forests adjacent to the non-native plantation areas, used satellite image analysis to measure forest cover and detected little loss of natural forest in most of the areas it seeks to conserve. In one of the study areas, the analysis detected the expansion of natural forest. It also claimed that the abundance of plant and animal species in the native forest has remained unchanged during the project implementation, on the basis of field surveys.

The REDD projects claimed that biodiversity benefits had been achieved on the basis of 1) greater forest cover remaining than would have been present without the project and 2) fewer hunting infractions or poaching incidents than before the project was implemented. Two of the projects (CORAZU and ALTMAY) reported increased detection of illegal extraction due to increased presence of forest guards and interpreted this as a sign of stronger protection that will lead to reduced pressure on native species.

Though each of the five CCB Standards REDD projects included species monitoring in their plans, none of them presented results that allow the detection of trends in population sizes. These projects are all relatively new, with no more than four years of monitoring since the project start, making it difficult to detect population trends. In the case of the ALTMAY project, the monitoring period is shorter than the four years of project implementation, since the biodiversity species surveys began after the project start.

Table 6: A summary of the biodiversity monitoring results of the 17 forest carbon projects surveyed, as described in project documents.

	Project	Does the project report describe positive impacts on biodiversity?	Years of implementation (until the report date)	Main biodiversity results of project implementation
A/R Projects	TKEN1 Kenya	Yes	7	185 ha of native trees established, comprised of 63,000 individual trees
	TKEN2 Kenya	Yes	7.5	322 ha of native trees established, comprised of 86,042 individual trees
	TKEN3 Kenya	Yes	8.5	1203 ha of native trees established, comprised of 300,970 individual trees
	TKEN4 Kenya	Yes	9	446 ha of native trees established, comprised of 91,577 individual trees
	TUGA1 Uganda	Yes	10	6.2 ha of native trees established, comprised of 4,540 individual trees
	TUGA2 Uganda	Yes	10	2.5 ha of native trees established, comprised of 1,134 individual trees
	TIND1 India	Yes	9	589.1 ha of native trees established, comprised of 600,154 individual trees
	CACRAV Colombia	Yes	9	Number or hectares of native trees planted to replace pasture was not clearly indicated. Monitoring of other plant and animal species was done, but neither methods nor results are clearly presented.
	TGB Uganda	No	9	2,773.2 ha of forest using Plan Vivo management methods
	UCHMAP Tanzania	Yes	6	Remote sensing revealed no difference in forest cover in most areas managed for conservation compared to the starting conditions. In one area, there was increased forest cover and increased erosion. Surveys of plant and animals did not reveal changes in species compositions.
	CHHAT India	Yes	10	248 ha of native tree species planted on previously barren wasteland
REDD Projects	CORAZU Peru	Yes	4	Forest cover is similar from 2008 to 2012, and the number of infractions for illegal hunting, logging, fishing and the use of exotic species decreased.
	KASPH1 Kenya	Yes	1	Native species were planted, Counts of the target mammal species conducted, but no trend data was presented.
	KASPH2 Kenya	Yes	1	Native species were planted, Counts of the target mammal species conducted, but no trend data was presented.
	MAINDO DRC	Yes	1.5	Logging concession converted to conservation concession; Flora and fauna transects completed; biodiversity training workshops held. Quantitative results not presented
	NKCAP Bolivia	n/a	8	Not presented in publicly available documents
	ALTMAY Peru	Yes	4	4,646 ha of avoided deforestation as compared to the baseline; quantitative results to show reduced fragmentation compared to projected deforestation patterns; 51.2 ha reforested with native spp.; biodiversity trainings held; increased interception of illegal extraction of flora and fauna

4.0 DISCUSSION

Robust assessment of the biodiversity impacts of forest carbon projects requires clear statements of their biodiversity goals, descriptions of threats to biodiversity and the project activities that will combat these threats, monitoring of carefully selected indicators that are sensitive to changes in biodiversity, and an appropriate counterfactual (analogous to an emissions baseline) for comparison with monitoring results. Most of the projects reviewed for this study addressed these elements to some degree, though in many cases, a lack of detail limits the ability of the projects to make robust claims about biodiversity benefits. More rigorous attention to generating and reporting on biodiversity benefits would improve the ability of forest carbon projects to deliver concrete biodiversity benefits.

4.1 BIODIVERSITY OBJECTIVES AND ACTIONS TO ENHANCE BIODIVERSITY

While all of the forest carbon projects reviewed had goals to provide positive outcomes for biodiversity, most of the project documents included only broad, qualitative biodiversity goals and provided few details about the activities that will be undertaken to ensure positive outcomes and avoid negative impacts. In addition, none described the time frame over which they expect to generate biodiversity benefits.

Most of the A/R projects included goals of planting native trees to provide habitat for species not found on degraded lands, reduce pressure on native forest by providing a source of timber, and/or improve connectivity of native forest, facilitating animal movement. However, none of these projects provided details about these goals. For example, none described the desired composition of the plant and animal communities that might be created through tree plantings. None of the projects explained which negative biodiversity impacts could be avoided by reducing pressure on native forests, and none indicated which species would benefit from improved connectivity. Instead, the projects provided very basic descriptions of the without-project conditions, indicating that tree planting would be done on degraded lands, but contained no detailed descriptions of the biodiversity conditions of those lands. The lack of specificity in the project goals and the lack of precise descriptions of the baseline conditions greatly limits the ability of projects to make detailed claims about biodiversity benefits

All six of the REDD projects had goals of conserving large areas of forest that contain threatened species. A subset of the projects included goals of reducing illegal logging and hunting or protecting a wildlife corridor. These projects used deforestation baselines as a way to measure the amount of habitat conserved, but none provided details on the expected biodiversity benefits of habitat conservation. Useful details might include quantitative estimates of the amount of rare or endangered habitat that can be protected by the project. Similarly, the goal of protecting habitat for threatened species is important, and quantitative targets for the populations of threatened species would allow for much stronger assessment of the biodiversity impacts of the project.

Precise descriptions of the biodiversity goals of a project should include not only the potential positive impacts of the project, but also the identification of potential negative impacts, so that these can be avoided. For example, REDD projects should be designed not only to ensure the conservation of large, contiguous areas of biodiverse forests (thereby providing habitat, resources and landscape connectivity that benefit biodiversity conservation), but also to avoid further forest loss, degradation and fragmentation, and to reduce the specific drivers of biodiversity loss (e.g., hunting, invasive species, altered fire regimes; Harvey *et al.* 2010). Reforestation projects should similarly be designed both to provide direct positive outcomes for biodiversity and to reduce potential negative impacts that might occur. To avoid negative impacts on biodiversity, reforestation projects should avoid clearing native vegetation to establish tree plantations, avoid planting trees that could become invasive, and ensure that tree plantations do not negatively affect key ecosystem processes such as fire and hydrological regimes or displace pressure for firewood or timber to other sites of high biodiversity value (Harvey *et al.* 2010, Lindenmayer *et al.* 2011). Ten of the eleven A/R projects reviewed included explicit statements about potential negative impacts on biodiversity (as required by the CCB Standards) and all but one of these concluded that no negative impacts were expected. The project that did identify potential negative impacts (UCHMAP) described ways to mitigate these. Five of the six REDD projects considered potential negative impacts on biodiversity and only one of these (ALTMAY) indicated that risks exists. That project also described mitigation actions.

In addition to clear descriptions of biodiversity objectives, it is important that projects clearly describe the actions that will be taken to ensure that biodiversity objectives are met and that these actions are logically linked to the objectives. Seven of the A/R projects (Table 3) aim to improve landscape connectivity for wildlife, yet these projects provided little detail about how plantations will be situated within the landscape to facilitate this connectivity. In addition, there was no mention of which species might benefit from this increased connectivity and how this will be monitored. Similarly, reforestation is described as a biodiversity benefit for 10 of the 11 A/R projects, but some use a large percentage of exotic species, which have limited value for biodiversity conservation (Barlow *et al.* 2007). The REDD+ projects, in contrast, did a better job of matching project activities with biodiversity goals, clearly identifying which actions will be taken to reduce deforestation and degradation and also including actions to detect and deter illegal activities (such as hunting or illegal logging) which negatively impact biodiversity conservation. However, they provided insufficient information to assess whether these actions will be sufficient to improve biodiversity. In addition, although all of the forest carbon projects mentioned threats to biodiversity, few of them provided details on the severity or distribution of these threats across the project site, so it is unclear whether the projects will be able to appropriately spatially target their interventions to effectively tackle these treats.

A lack of information about current biodiversity conditions is a barrier for projects seeking to provide more specific conservation goals. In the case of A/R projects, this includes a lack of information about the type and intensity of pressure on nearby native forest, and about the biodiversity conditions in the degraded lands, which could be significant (Tyrell and Alcorn 2011). In REDD projects, a lack of information about the populations of the threatened species that the projects seek to protect also leads to vague goals.

4.2 THREATS

Many of the forest carbon projects (especially the A/R projects) provided limited information on the threats to biodiversity, which makes it difficult to design conservation actions that will effectively address these threats. For example, if a lack of connectivity endangers populations of threatened species, then A/R projects could be designed to maximize connectivity, through site selection or the use of species that promote animal movement.

The REDD+ projects described specific threats like illegal logging and hunting that contribute to biodiversity loss, and they did include actions to address these threats, like increased patrolling and alternative livelihood activities. Habitat loss was the principal threat listed by these projects, however, and more detailed assessments of how this threat would impact biodiversity would be valuable. Each of the projects developed spatially explicit models of deforestation to project an emissions baseline, but these models were not used to describe threats to specific habitat types across the landscape. Explicit consideration of which habitats are threatened could allow for planning interventions to best conserve the highest conservation value habitats.

Given the importance of identifying the specific threats to biodiversity, projects would likely benefit from requirements for more detailed descriptions of threats to biodiversity. The CCB Standards (CCBA 2008) do require a description of threats to biodiversity, but an emphasis of the importance of this and more detailed requirements about how to describe threats could improve project design. Similarly, additional guidance materials like the Social and Biodiversity Impact Assessment Manual for REDD+ Projects (Richards and

Panfil 2011, Pitman 2011) and capacity building efforts for project developers and auditors about how to identify and document threats to biodiversity would also be beneficial.

4.3 CONTRIBUTIONS OF FOREST CARBON PROJECTS TO NATIONAL BIODIVERSITY OBJECTIVES

The projects reviewed for this study did not indicate that they are contributing to national biodiversity objectives. Given the potential synergies between forest carbon projects and biodiversity conservation, this is a missed opportunity. Forest carbon projects could potentially play a key role in supporting national biodiversity goals and helping countries meet their CBD commitments. Most countries are signatories to the CBD and have developed NBSAPS for implementing the convention at the national level. NBSAPs are currently being revised in many countries to show how countries will meet the Aichi Targets, which include multiple REDD+ relevant goals, like halving the rate of natural habitat loss by 2020 (Miles et al. 2013). The selection of goals that are consistent with national biodiversity priorities is likely to increase support for a project within a country. This synergy could be increased if projects are also able to apply monitoring methods that are used nationally, and if they contribute monitoring data to a national monitoring system.

Forest carbon projects also have important potential synergies with the safeguards systems that countries are developing as part of their national REDD+ programs. The specific biodiversity goals and monitoring approaches for safeguards have not been developed in most countries, and there may be opportunities for projects to contribute methodologies or data to the safeguards systems. For projects with aspirations of being formally recognized as part of national REDD+ programs, it will be important that all aspects, including the approach to biodiversity conservation, are aligned with the national program's requirements.

4.4 MONITORING OF BIODIVERSITY IN FOREST CARBON PROJECTS

In order to adequately monitor the impacts of forest carbon projects on biodiversity, it is important that projects have a clear, detailed and scientifically rigorous monitoring plan. The monitoring plan should clearly specify which components of biodiversity will be monitored (individual species, particular taxonomic groups, particular ecosystems) and why, what indicators will be used, how these components will be monitored (i.e., remote sensing methods, field based methods), the sampling strategy to be used (including location/frequency of monitoring and sampling design) and how the observed changes (or lack thereof) will be attributed to the projects. It is particularly important that forest carbon projects carefully document the starting conditions and counterfactuals, so that they can determine the extent to which any subsequent changes (or lack therefore) can be attributed to the forest carbon project (Dickson and Kapos 2012). Projects must document a counterfactual scenario for emissions and a similar scenario for biodiversity should be based on the land-use changes that are used for the emissions scenario. This is a requirement of the CCB Standards, but the reviewed projects would be able to better document changes in biodiversity if they had developed more explicit counterfactuals.

In addition, it is critical that biodiversity monitoring be conducted using a rigorous sampling strategy with standardized and replicable methodologies, and that the sampling intensity and frequency is sufficient to detect any potential changes in biodiversity (both within the project area and in adjacent areas) and attribute these changes to project activities (Dickson and Kapos 2012, Gardner *et al.* 2012). The indicators that are used in the monitoring plans of the projects that were reviewed are summarized in Table 7. While these may all be appropriate parts of a biodiversity monitoring plan, they are generally not sufficient when used alone. A more precise understanding of biodiversity changes requires going beyond the use of forest area as a sole proxy for biodiversity conservation. While forest cover is a useful starting point for assessing biodiversity, it is also important to detect changes in the overall forest composition and structure and the degree of forest fragmentation or connectivity in the surrounding landscape. Second, biodiversity monitoring should not rely only on remotely-sensed indicators of forest cover, and should include field measurement on the abundance or population growth rate of species of conservation concern. In forests where hunting is an important threat, it is possible that forest carbon projects could result in forests that have intact vegetation but are lacking fauna due to unsustainable hunting. Collecting information on the status and trends of animal species of conservation concern (and hunted species) would therefore be helpful in detecting the project's impact on these species. It is also important for projects to collect information on the status of threats to biodiversity (such as the severity or frequency of hunting or poaching), as this information- together with information on forest cover- can provide valuable insights into the overall status of biodiversity.

Where possible, projects should consider implementing local or community-based monitoring that takes advantage of the existing ecological knowledge of local people. Designing this type of monitoring may require initial investments in training but could lower long-term costs and generate strong local ownership of the project and greater commitment to conservation activities.

Table 7: A summary of the types of indicators being monitored under the 17 forest carbon projects to provide insights on how the projects are affecting biodiversity. Numbers refer to the number of projects (out of 17 possible) that reported using a given variables are listed in order from the most to least common.

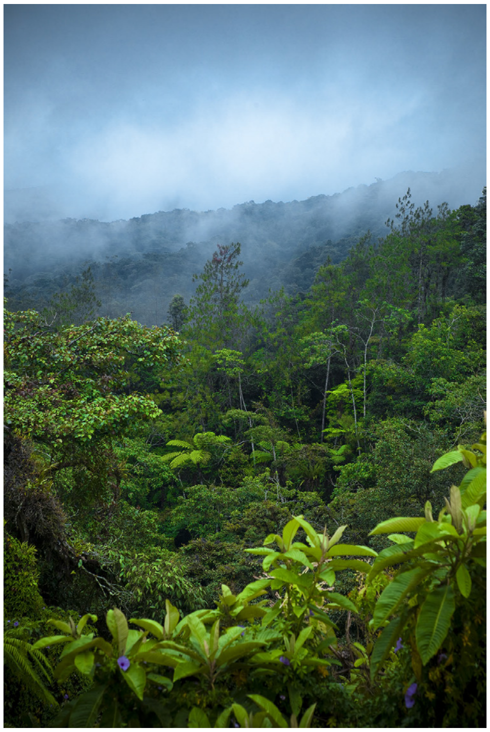
Indicators related to the reforested areas	Indicators related to forest cover	Indicators for biodiversity	Indicators related to threats to biodiversity
• Total area planted with trees(10) • Number and area of native trees by species and age (10) • Number of trees planted (7) • Tree establishment and growth (1) • Canopy structure (1)	• Habitat cover (2) • Flora surveys (2) • Area and status of native forest and/or natural vegetation in project area (1) • Forest fragmentation (1)	Wildlife sightings/observations (3) Fauna surveys (1) Presence and abundance of hunted species (1) Population size of bonobos (1) Primate monitoring (1)	• Fire frequency (2) • Number of poaching incidents observed during patrols (2) • Numbers of illegal hunters and loggers (1) • Frequency or intensity of logging, hunting, and agricultural conversion (1) • Illegal extraction of species (1)

4.5 BIODIVERSITY RESULTS

The biodiversity results described by the projects were general, making it difficult to assess their significance. Ten of the A/R projects provided data on the number of native trees established or the area planted, but did not provide data to describe changes in community composition within the plantations, or changes in pressures on nearby forests or connectivity between forest fragments. Similarly, several of the REDD projects based claims of biodiversity impacts on the area conserved. It is likely that the REDD projects will indeed have significant positive outcomes from biodiversity due to the large areas of native forest (range of 30,166 to 1,351,963 ha) they will protect, as long as actions to reduce specific threats to biodiversity and the displacement of threats are addressed. However, while habitat extent is an important indicator of biodiversity conservation, it is insufficient without field data to show changes in community composition or the population sizes of key species. Documenting project impact also requires comparison with a counterfactual. Though several of the projects tracked wildlife observations or illegal hunting, none of these presented comparisons with a counterfactual in a way that allows for a clear understanding of impacts.

Changes to community composition or populations of key species take time and the reviewed projects have been operating for a relatively short time (ranging from one to ten years). In several cases the biodiversity monitoring did not begin until after the project start, making trends even more difficult to detect. Nevertheless, more comprehensive and detailed monitoring will be needed in the future to provide specific information about the conservation impacts of the projects.

4.6 RECOMMENDATIONS FOR HOW TO ENHANCE THE BIODIVERSITY BENEFITS OF FOREST CARBON PROJECTS



On the basis of our review, we suggest a number of ways that forest carbon projects can provide greater positive impacts for biodiversity while avoiding harm. We recognize that projects must consider trade-offs between biodiversity conservation and the emissions reductions and social benefits that they seek to achieve. However, improved outcomes for biodiversity can be achieved without incurring major costs if biodiversity outcomes are explicitly considered throughout the project cycle. Recommendations include:

1. Integrate planning for biodiversity conservation at the time of project design. The strongest outcomes are likely to come when biodiversity is explicitly considered as a priority early in the planning process and specific activities are designed to ensure positive biodiversity outcomes.

2. Explicitly consider potential biodiversity benefits when prioritizing sites for REDD+ projects, select sites that have high biodiversity value (such as key biodiversity areas, areas of high endemism, areas with many vulnerable, threatened or endangered species, or critical biological corridors) and are aligned with national biodiversity priorities, including those described in NBSAPs and national REDD+ strategies.

3. In A/R projects, maximize potential biodiversity benefits by creating structurally and floristically diverse plantations of native species, locating plantations on degraded lands, avoiding the use of invasive species or species that could alter hydrological regimes.

4. Identify threats to biodiversity and consider how these may differ from threats to carbon stocks (both spatially and temporally) and design specific actions to address these threats. While some of the threats to biodiversity (e.g., habitat loss, forest fires, agricultural expansion) are the same as those to carbon stocks, there are often additional threats to biodiversity (e.g., hunting, invasive species, forest fragmentation, pollution of water bodies) which need to be addressed in order to achieve biodiversity goals.

5. Clearly describe the expected without-project outcomes for biodiversity (analogous to the emissions baseline) and use quantitative projections of the status of the biodiversity targets to allow for clear comparisons with the biodiversity monitoring results. For example, if a goal is to protect an endangered species population, then present quantitative information about the population size at the start of the project, and a projection in light of expected land-use change in the absence of the project.

6. Be explicit about what the expected biodiversity benefits of the project are and how these benefits will be obtained. Provide detailed information about the flora and fauna present in the study area (including, where possible, information on species abundance, population size and growth rates) and identify specific actions to ensure the conservation of these species.

7. Include local people in the design and implementation of biodiversity monitoring and apply traditional ecological knowledge, where possible, as this will create greater awareness of biodiversity issues and also encourage local support for conservation activities.
8. Include monitoring methods that are compatible with the monitoring being used for national biodiversity monitoring initiatives, like those done for national reports to the CBD and REDD+ safeguards.
9. Include indicators of pressure (threats to biodiversity), state (status of the forest and populations of target species), and response (actions taken by the project), including indicators that signal potential negative impacts. Potential negative impacts should be identified by both stakeholders and experts with a thorough understanding of the project.
10. Plan biodiversity-specific monitoring to measure progress towards achieving the goals, including indicators of planned activities being implemented as well as indicators that show longer-term outcomes and impacts on biodiversity.
11. Establish a clear, systematic and regular process for reviewing the results from biodiversity monitoring and adapting project activities as needed, to ensure biodiversity benefits are achieved.

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ANNEX 1: PROJECT DOCUMENTS CONSULTED

TIST Program in Kenya
CCBA Project Description for TIST Program in Kenya CCB-001 (14 February 2011)
CCBA Project Implementation Report for TIST Program in Kenya CCB-001 (28 April, 2011)
CCBA Monitoring Plan for TIST Program in Kenya CCB-001 (14 February, 2011)
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U.S. Agency for International Development

1300 Pennsylvania Avenue, NW

Washington, DC 20523

Tel: (202) 712-0000

Fax: (202) 216-3524

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